

Operating Instructions

Temperature Controller Unit ETR 112



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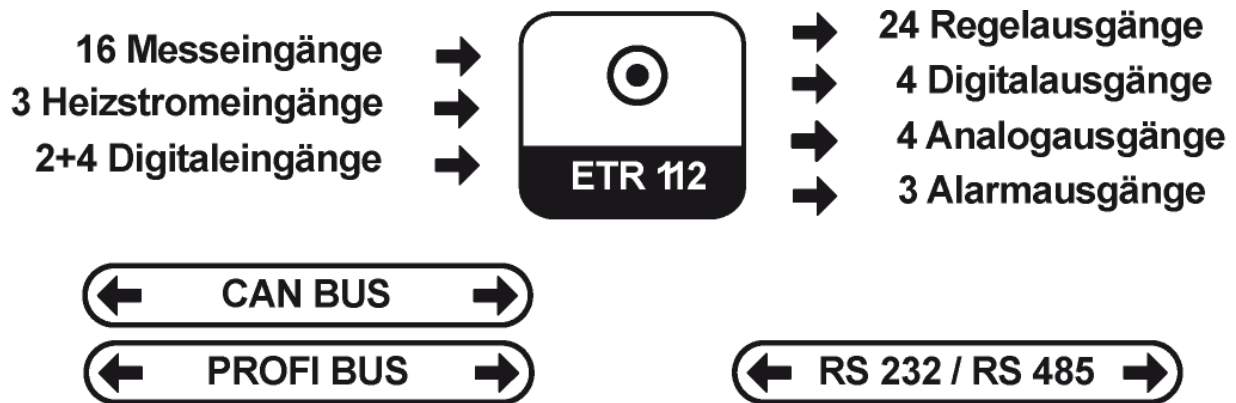
1 Introduction

Building on a common platform, the temperature control system sysTemp® offers three different concepts for customized multi-zone temperature control.

The common platform of sysTemp® guarantees continuity with the configuration and parameterization, as well as with the connection over the available digital interfaces. Every controller can have up to three digital interfaces in this case: RS485, CAN-Bus, Profibus DP.

The powerful and universal temperature controller unit **ETR 112** is designed for employment in hot runner applications, machines for the plastics processing, packaging machines, furnaces, foodstuffs processing, dryers, etc. With its adaptive parameter matching, it can be used in a wide field of application from extremely fast to extremely slow zones.

The ETR 112 with 12 or 16 zones (dependent on the number of the cooling zones), with additional inputs and outputs, is suitable for the realization of supplementary functions ideally for decentralized system designs.



The device is available in different implementations. This must be considered at installation and operational start-up. You find more detailed references to that in the chapter *->Equipment implementation* and *->Electrical connection and operational startup*.

These directions assist, both in case of the initial installation and operational startup of the device, and in case of changes and adaptations to existing control systems. Status and fault signals are described and remedial actions proposed for their removal.

The protocol descriptions for serial interface, CAN-Bus, Profibus DP & DPEA are not a component part of the operating manual. You are provided with these on request or directly as a download from the home page.

1.1 Typographical conventions

Symbols and conventions are used in this manual for faster orientation for you.

Symbols

	Caution	With this symbol, references and information are displayed which are decisive for the operation of the device. In case of non-compliance with or inaccurate compliance there can result damage to the device or injuries to persons.
	Note	The symbol refers to additional information and declarations, which serve for improved understanding.
	Example	With the symbol, a function is explained by means of an example.
	Reference	With this symbol, information in another document is referred to.
	Tip	Here you get useful hints.
		Cross references are marked with this character. In the pdf version of the document the objective of the cross reference is reached via the link.
Equations		Calculation specifications and examples are represented in this way.

1.2 Additional and continuative documents

	Protocol PSG II	Information on this topic are in the protocol description PSG II and the corresponding object lists.
	Protocol Profibus DP & Profibus DPEA	Information on this topic are in the protocol description Profibus DP & Profibus DPEA and the corresponding object lists.
	Protocol Modbus	Information on this topic are in the protocol description Modbus and the corresponding object lists.
	Protocol CANopen	Information on this topic are in the protocol description CANopen and the corresponding object lists.
	Data sheets and operating manuals	Available by Internet see www.psg-online.de .

2 General Information

2.1 Guarantee conditions

This product is subject to the legal warranty time periods for faults or deficiencies in manufacture.

Content of the guarantee

If a malfunction relatively occurs through the manufacture, the manufacturer repairs or replaces the nonconforming product, according to their own discretion.

The following repairs do not fall under the guarantee and liable to costs:

- Malfunctions after the legal notice periods have expired.
- Malfunctions caused through operating error of the user (if the device is not operated as described in the manual).
- Malfunctions caused through other devices.
- Changes or damage to the device which do not originate from the manufacturer.

If you wish to use services within the framework of this guarantee, please refer to the manufacturer.

2.2 Installation and safety references



Before installation, actuation or operation of the device, please read through this operating manual completely and carefully.

This device corresponds to the European Directives for Safety and EMC. It is within the sphere of responsibility of the commissioning engineer to keep to these directives during the installation of the device.

CE marking

The device complies with the European Directives for electromagnetic compatibility (complies with EN 61326-1).

Safety standard

This device corresponds to the European low-voltage guideline 73/23/EEG, extended through 93/68/EEG, subject to application of the Safety Standard EN 61010.

Electro-Magnetic Compatibility (EMC)

This device is in conformity with the EMC Directive 89/336/EEG, extended through 93/68/EEG and the necessary protection requirements. The device is planned for applications in the industrial sector in accordance with EN 50081-2 and EN 50082-2.

Service and repair

This device is maintenance free.

If the device should indicate a fault, you please contact the manufacturer. Customer repairs are not permissible.

Cleaning

Employ no water or cleaning agents based on water for the cleaning of the device stick-on labels. You can clean the surface of the devices with a mild soap solution.

Storage

If you should not put the device into operation immediately after unpacking, protect it against moisture and coarse dirt.

Personnel

The installation of the device may be carried out by qualified personnel only.

Wiring

The wiring system must be implemented correctly according to the specifications in this operating manual. All feeds and connecting terminals must be dimensioned for the corresponding amperage. Furthermore, all connections are to be carried out according to the valid VDE Specification and/or the respective national specifications.



Ensure in particular that the AC power supply is not connected with the logic output or the low-voltage input.

Overload protection

Secure the power supply of the device and the relay output with a fuse protection or a power circuit-breaker. This protects the printed circuit boards against overcurrent.

Environment

Conducting contamination must not reach the proximity of the device connecting terminals in the control cabinet. In order to achieve suitable ambient air conditions, install an air filter in the air inlet of the control cabinet. If the device should be in a condensing environment (low temperatures), install a thermostat-controlled heating unit in the control cabinet.

3 Equipment implementation

3.1 Type designation

The equipment of the device, over and beyond the standard type, is stipulated with the order. The exact specification can be read off on the -> *Type designation plate* type designation plate, which is on the carton, the casing and the printed circuit board.

The type designation identifies the equipment version and is composed of the options.

ETR112		
Electrical connections	K FZ	Screwed terminal Spring terminal
Melt pressure	MD -	Melt pressure (only for X4/13/14 4-20 mA) Not existing
Measurement inputs 13, 14	TCPt TCPt/1300 U I	Thermocouple TC / resistance thermometer Pt100 Thermocouple up to 1300 °C Standard signal U 0/2...10V Standard signal I 0/4...20mA
Measurement inputs 15, 16	TCPt TCPt/1300 U I	Thermocouple TC / resistance thermometer Pt 100 Thermocouple up to 1300 °C Standard signal U 0/2...10V Standard signal I 0/4...20mA
Data interface 2	- CAN CANopen	Not existing Can-Bus with PSG-CAN plug assignment CAN-Bus with CANopen-conforming connector pin assignment
Data interface 3	- Profi	Not existing Profibus DP
OPTION AO	- AO	Not existing Analog outputs 1...4
Voltage	24V	24 V AC/DC
Data interface 1 RS232 / RS485 is always existing as standard.		

3.1.1 Type designation plate

The following information can be taken from the type designation plate:



- 1** -> *Type designation*
- 2** Revision identification (HW*) of the printed circuit boards
- 3** Revision identification (SW*) of the controller software
- 4** Order number ANr.
- 5** Serial number SNr.

2 **3** **5**

3.1.2 Standard implementation

The temperature controller unit ETR 112 is designed in the standard implementation as follows:

- Screwed terminals
- 16 Universal measurement inputs thermocouple TC / resistance thermometer Pt100
- 24 Control outputs
- 3 Measurement inputs heating current monitoring (three-phase)
- 3 Alarm outputs
- 2 Digital function inputs
- Each 4 digital inputs / outputs
- RS232/RS485 interface

3.2 Scope of delivery

- 1 Temperature controller unit ETR112
- 1 CD-ROM with full documentation and software

3.3 Accessories

Operation and display

BA operating and display unit
(Details, see data sheet)



Operator terminal BA Touch
Order number: 020 270



Output modules and power circuit-breakers

SMAO 04
Order number: 020 323



SMS 01
Order number: 020 332-5



SMK 02 / SMK 04
Order number: 020 218 / 020 219



Measured value recording

CANAIN 08
Order number: 020 365



Heating Current Monitoring

ESW 40
Order number: 039 014



ESW 75
Order number: 039 049



ESW 200
Order number: 039 048



SSW 120P
Order number: 020 312-1



SUW
Order number: 020 315



CAN accessories

CANVTM 2K / 4K
Order number: 020 318 / 020 314-1



CANREP
Order number: 020 317



CANDAT
Order number: 020 349-1



Software / Online maintenance

WinKonVis
Order number: 039 020



WinKonVis Server
Order number: 039 021

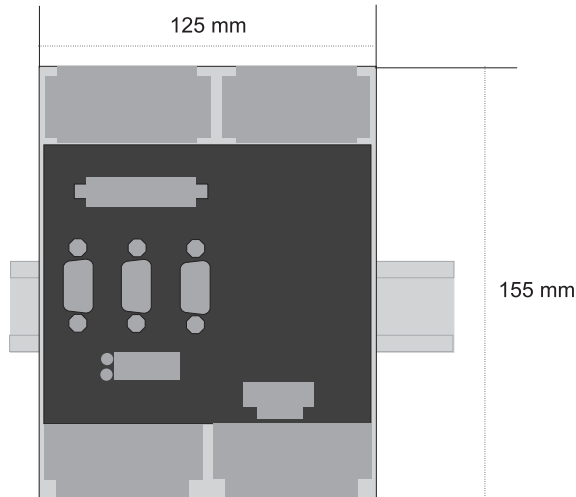


webremote
Order number: 020 346



4 Device construction

4.1 Dimensions



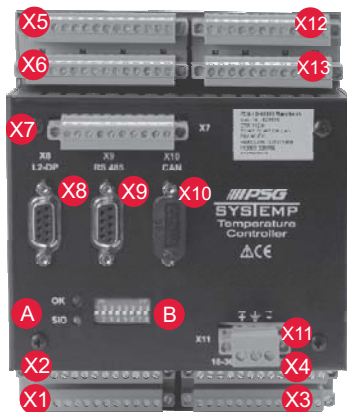
The ETR112 has a securing mechanism for the installation on DIN rail (DIN 50022) see -> *Installation/Dismantling*.

4.2 Connection overview

The connection overview here indicates all possible connection variants.

The actual connection overview depends on the -> *Equipment implementation* which is stipulated with the order.

ETR112



X1, X2	Measurement inputs 1...4 & 5...8 (TC / Pt100)
X3	Measurement inputs 9...12 (TC/Pt100)
X4	Measurement inputs 13...16 (TC/Pt100, analog inputs)
X5, X6	Control outputs 1...12, control outputs 13...24
X7	Alarm outputs 1...3, digital inputs 1...2
X8	Profibus DP
X9	RS485/ V24
X10	CAN-Bus
X11	Power supply
X12	3 Heating current inputs, OPTION analog outputs 3...4
X13	Digital inputs 1...4, digital outputs 1...4, OPTION analog outputs 1..2
A	Status LED's
B	DIP switch

4.2.1 Status LED's

The SIO-LED (yellow) signalizes the interface operation and flashes quicker or slower due to the amount of data. In the normal case the OK-LED (green) on the front panel of the controller lights up permanently.

The LED flashes if there is a fault. The cause of error can be read off on the basis of the number of flashing signals. Detailed information about the error cause can be referred to in the chapter -> *System error* and -> *Summary of system errors / flashing codes OK-LED*

4.2.2 DIP switch

Detailed information on the function of the DIP switches are in the chapter -> *Addressing and Further Functions by DIP Switch*

5 Installation/Dismantling

ESD Avoidance



To avoid ESD damages the device must be handled, packed, unpacked and stored in an especially protected environment (Electrostatic Protected Area, EPA). An ESD-protected work environment conducts existing electrostatic charges to ground in a controlled manner and prevents their re-occurrence.

Unpacking

The device is packed fully-mounted in a robust carton, cushioned with foamed material.

Check the packaging and then the device for identifiable damage incurred during transit. If damage is identified, then please get in touch with the transportation company.



In the case of damage the device may not be brought into operation.

Ensuring voltage-free state



Before beginning and during all installation/dismantling work, attention is to be paid that the system, as well as the devices, are de-energized

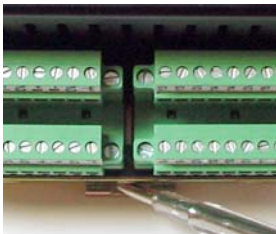
Installation location

A device of the protection type IP20 is to be installed in a closed control cabinet.

Securing

The device has a securing mechanism for installation on a DIN rail (DIN 50022).

Installation/Dismantling



The device is initially suspended in the DIN rail with the two straps (rear/middle side) and then latched in. For dismantling, the unlocking mechanism on the front below at the device (Illustration) is to be screwed down with a screwdriver and the device taken out towards the front/above.

Device exchange



Only controllers of similar type may be exchanged. In case of replacement, it is absolutely necessary to adopt the setting adjustments of the replaced controller.

6 Electrical connection and operational startup



The ETR112 may be installed and put into operation by specialist personnel only.

Before switch-on of the control zones it is to be ensured that the ETR112 is configured for the application. An incorrect configuration can lead to damage to the control section or to injuries to persons.

6.1 Connection type

In the standard type the device is equipped with screwed terminals. The terminals existing on the device are to be taken from the -> *Type designation*

The following plugs of the Co. Phoenix Contact are employed for the individual connections:

Connection	Type designation Plug for screwed terminal	Type designation OPTION Plug for spring terminal
X1...X4	MCVR 1.5/13-STF-3.81	FK-MCP 1.5/13-STF-3.81
X5...X6	MCVR 1.5/14-STF-3.81	FK-MCP 1.5/14-STF-3.81
X7	MCVR 1.5/10-STF-3.81	FK-MCP 1.5/10-STF-3.81
X11	MVSTBW 2.5 HC/3-STF-5.08	FKC 2.5 HC/3-STF-5.08
X12...X13	MCVR 1.5/12-STF-3.81	FK-MCP 1.5/12-STF-3.81

The wiring system is implemented on the screwed terminals and spring terminals with the appropriate cable lugs. Cables with a cross section of 0.5 to 1.5mm² can be employed.

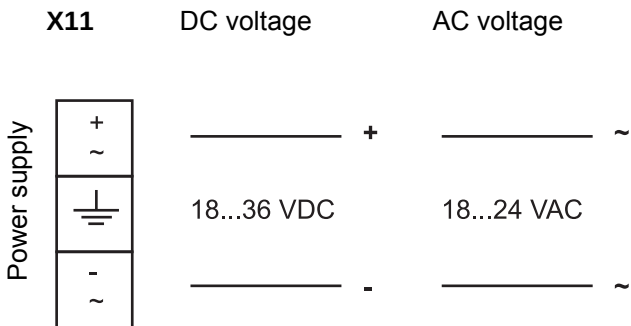


The terminal marking was modified. Here you find the new/old (identified by **NEW/OLD**) terminal marking described.

6.2 Connector assignment and basic configuration

6.2.1 Power supply (Connection X11)

6.2.1.1 Power Supply 24 V



Power consumption	Max. 25 VA on load
Fuse protection	External device fuse protection 4 A time-delay

6.2.2 Auxiliary voltage (Connection X7)

The auxiliary voltage could be employed as power supply for ->Control Outputs (Connection X5, X6), ->Digital Input (Connection X7, X13) and ->Digital outputs (Connection X7, X13).



6.2.3 Measurement inputs (Connection X1 to X4)

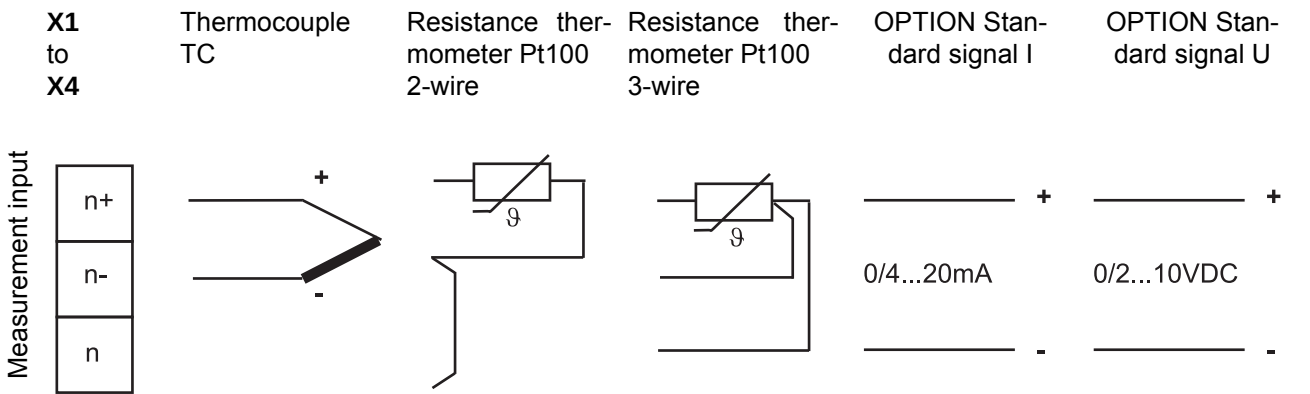
The device has 16 measurement inputs. The first 12 measurement inputs are designed for temperature registration by thermocouple TC/ resistance thermometer Pt100. The other 4 measurement inputs can be either of type thermocouple TC/ resistance thermometer Pt100 or standard signal I (0/4...20mA) and/or U (0/2...10VDC).

In the standard implementation the device has 16 universal measurement inputs thermocouple TC/ resistance thermometer Pt100. Per measurement input 3 terminals are available.

In the system setting the sensor type is defined for 4 measurement inputs, as well as the scale in case of standard signal inputs.

PIN	X1 NEW	X2 NEW	X3 NEW	X4 NEW
1	1+	5+	9+	13+
2	1-	5-	9-	13-
3	1	5	9	13
4	2+	6+	10+	14+
5	2-	6-	10-	14-
6	2	6	10	14
7	3+	7+	11+	15+
8	3-	7-	11-	15-
9	3	7	11	15
10	4+	8+	12+	16+
11	4-	8-	12-	16-
12	4	8	12	16
13	⚡	⚡	⚡	⚡

PIN	X1 OLD	X2 OLD	X3 OLD	X4 OLD
1	1+	5+	9+	13+
2	1-	5-	9-	13-
3	0V	0V	0V	0V
4	2+	6+	10+	14+
5	2-	6-	10-	14-
6	0V	0V	0V	0V
7	3+	7+	11+	15+
8	3-	7-	11-	15-
9	0V	0V	0V	0V
10	4+	8+	12+	16+
11	4-	8-	12-	16-
12	0V	0V	0V	0V
13	⚡	⚡	⚡	⚡



The specifications apply for all measurement inputs.

The standard signal inputs U and/or I are optional for the measurement inputs 13...16 available and have to be stipulated with the order. The possible combinations are to be taken from the ->Type designation.

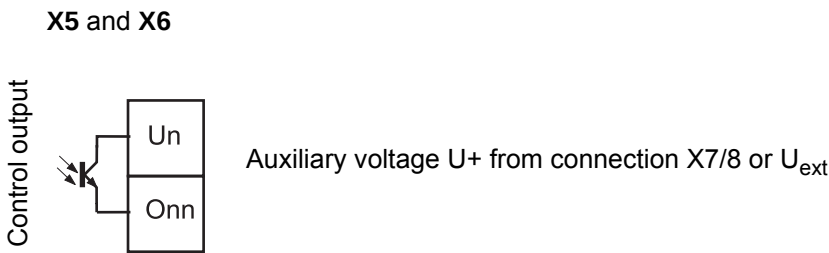
configuration

Arrange sensor type for the measurement inputs.	->[SP20] SEN1/SEN1 - Sensor Type Zone 1...4 ->[SP21] SEN2/SEN2 - Sensor Type Zone 5...8 ->[SP22] SEN3/SEN3 - Sensor Type Zone 9...12 ->[SP23] SEN4/SEN4 - Sensor Type Zone 13...16
Stipulate offset valid for all zones.	->[P029] OFFS/OFFS - Temperature Offset
Stipulate offset valid for the corresponding zones.	->[SP30] OFF1/OFF1 - Offset Zone 1...4 ->[SP31] OFF2/OFF2 - Offset Zone 5...8 ->[SP32] OFF3/OFF3 - Offset Zone 9...12 ->[SP33] OFF4/OFF4 - Offset Zone 13...16
Stipulation of the measuring range, when measurement input is of the standard signal type.	->[P042] ANZ-/RG L - Lower Temperature Level at Standard Signal Inputs ->[P043] ANZ+/RG - Upper Temperature Level with Standard Signal Inputs
Stipulate units of all measured values.	->[SP24] CELS/CELS - Temperature Unit °C/°F
Specification of the measuring channel, if measured value comes from a FIN 08 or CANAIN08 over CAN-Bus.	->[P057] NrIW/NoZN - Zone Allocation to Measurement Input on Sensor Interface FIN

6.2.4 Control Outputs (Connection X5, X6)

The allocation of the control outputs Heating/Cooling is defined by system setting.

PIN	X5 NEW	X6 NEW	PIN	X5 OLD	X6 OLD
1	U1	U1	1	+U	+U
2	U2	U2	2	+U	+U
3	O01	O13	3	O01	O13
4	O02	O14	4	O02	O14
5	O03	O15	5	O03	O15
6	O04	O16	6	O04	O16
7	O05	O17	7	O05	O17
8	O06	O18	8	O06	O18
9	O07	O19	9	O07	O19
10	O08	O20	10	O08	O20
11	O09	O21	11	O09	O21
12	O10	O22	12	O10	O22
13	O11	O23	13	O11	O23
14	O12	O24	14	O12	O24



Auxiliary voltage U- from connection X7/9 or 0V_{ext}.
The specifications apply for all control outputs.

Rated voltage30VDC

Rated output current<= 60mA

Inductive load only with external free-wheeling diode

Configuration

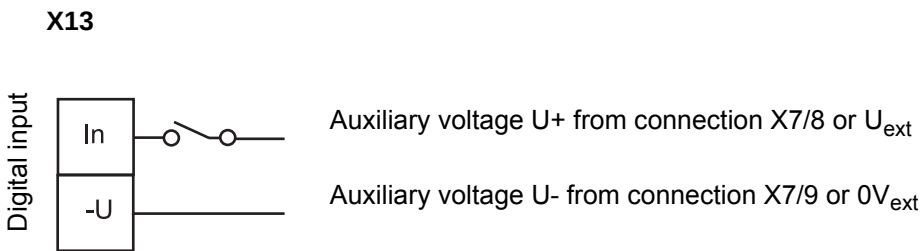
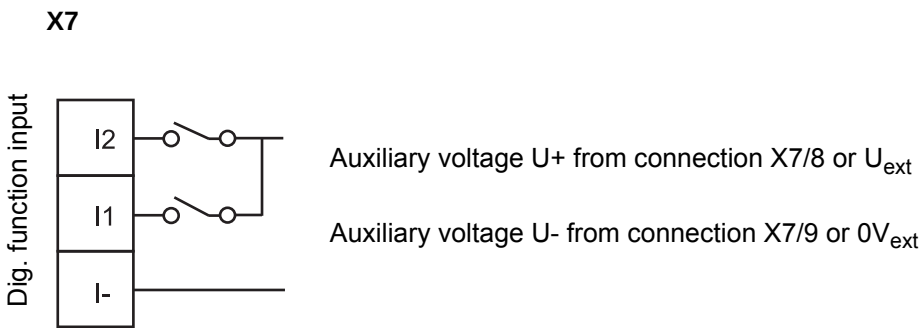
Definition, which digital outputs are assigned to which control zone.	->[SP52] ODEF/ODEF - Definition of Control Outputs
Define the operating mode of the control zone.	->[P034] KHLG/COOL - 3-Point Operation
Stipulates the manner in which the actuating signal is output at the control output.	->[P035] RELH/RELH - RELH/RELH - Heating Relay Output ->[P036] RELK/RELC - Cooling Relay Output
Is the cooling output used as alarm output, stipulate which alarm is output on the cooling output.	->[P038] AZD1/AZD1 - Alarm Output Definition Byte 1 ->[P039] AZD2/AZD2 - Alarm Output Definition Byte 2

6.2.5 Digital Input (Connection X7, X13)

The digital inputs are realized with optocouplers. The standard device is designed with 2 digital function inputs (at connection X7) and 4 digital inputs (at connection X13).
The digital function inputs, as well as the digital inputs, work with functions fixed stored in the controller, which are defined by the system setting.

PIN	X7 NEW	X7 OLD	Description
1	I2	IN2	Dig. function input 2
2	I1	IN1	Dig. function input 1
3	I-	IN-	Reference potential I *

PIN	X13 NEW	X13 OLD	Description
7	I1	DI1	Digital input 1
8	I2	DI2	Digital input 2
9	I3	DI3	Digital input 3
10	I4	DI4	Digital input 4



The specifications apply for all digital inputs.

Rated voltage

30VDC

Power requirement

approx. 5mA

Configuration

Stipulate function which is implemented on activation/deactivation of the two digital inputs on plug X7.	->[SP25] INPD/INPD - Function of Digital Inputs
Stipulates the function of the digital inputs/ outputs on terminal X13	->[SP51] DIO /DIO - Digital Inputs / Outputs

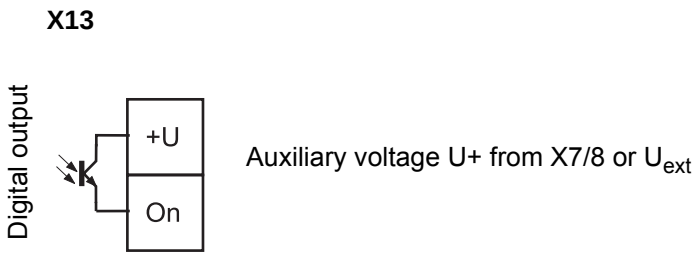
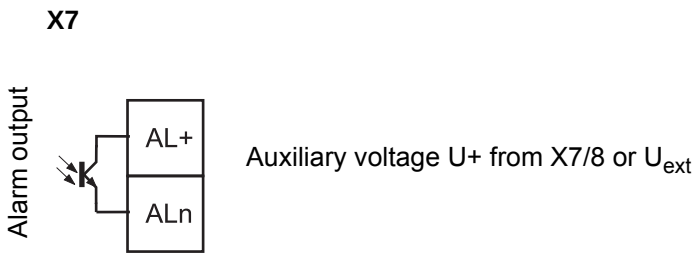
6.2.6 Digital outputs (Connection X7, X13)

The digital outputs are realized with optocouplers. The standard device is designed with 3 alarm outputs (at connection X7) and 4 digital outputs (at connection X13).
In the system setting is defined which alarms are output on the outputs and which function the digital outputs have.

PIN	X7	Description
4	AL3	Alarm Output 3
5	AL2	Alarm Output 2
6	AL1	Alarm output 1
7	AL+	Power supply alarm outputs

PIN	X13 NEW	X13 OLD	Description
3	O1	DO1	Digital output 1
4	O2	DO2	Digital output 2
5	O3	DO3	Digital output 3
6	O4	DO4	Digital output 4

Terminal marking OLD=NEW



Auxiliary voltage U- from connection X7/9 or 0V_{ext}.
The specifications apply for all digital outputs.

Rated voltage	30VDC
Rated output current	<= 60mA
	Inductive load only with external free-wheeling diode

Configuration

Stipulate function of the alarm output 1.	->[SP10] A1D1/A1D1 - Definition Byte 1 - Alarm Output 1 ->[SP11] A1D2/A1D2 - Definition Byte 2 - Alarm Output 1 ->[SP12] A1D3/A1D3 - Definition Byte 3 - Alarm Output 1
Stipulate function of the alarm output 2.	->[SP13] A2D1/A2D1 - Definition Byte 1 - Alarm Output 2 ->[SP14] A2D2/A2D2 - Definition Byte 2 - Alarm Output 2 ->[SP15] A2D3/A2D3 - Definition Byte 3 - Alarm Output 2
Stipulate function of the alarm output 3.	->[SP16] A3D1/A3D1 - Definition Byte 1 - Alarm Output 3 ->[SP17] A3D2/A3D2 - Definition Byte 2 - Alarm Output 3 ->[SP18] A3D3/A3D3 - Definition Byte 3 - Alarm Output 3

6.2.7 Heating Current Inputs (connection X12)

The standard device is designed for registration of three 3-phase heating currents.

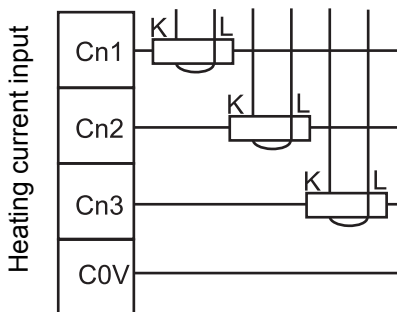
In the system setting the measurement method is stipulated.

Use the current transformers available as accessories by PSG Plastic Service GmbH.

PIN	X12 NEW
1	n.a.
2	n.a.
3	C11
4	C12
5	C13
6	C21
7	C22
8	C23
9	C31
10	C32
11	C33
12	C0V

PIN	X12 OLD
1	n.a.
2	n.a.
3	I11
4	I12
5	I13
6	I21
7	I22
8	I23
9	I31
10	I32
11	I33
12	0V

X12



Do not connect C0V system overall!
Do not ground C0V terminal!

Using the supply voltage measurement module SUW the system parameter SUW defines, on which current measurement input the SUW module is connected.

The specifications apply for all heating current inputs

Input 42mV/A
Input resistance 20kOhm

Configuration

Specify method of measurement of heating current.	->[SP26] ADEF/AMPD - Heating Current Measurement Method
Comparative value for the heating current of the measured zone.	->[P007] ASOL/AMPN - Current Setpoint Value
Stipulate tolerance value for control of heating current value.	->[P006] ATOL/AMPT - Current Tolerance
Stipulate the measurement input where the current transformer of the controlled zone is connected to.	->[P056] SUMW/NoTR - Allocation of Current Transformer

Stipulate the scale of the measurement input.	-> <i>[Zone 041] AEND/AMPE - Current Range End Value</i>
Stipulate the value of the heating current that rises an alarm in case of switched-off heating.	-> <i>[SP37] MSAA/AMPM - Maximum Current Value with Measurement Heater Off</i>

6.2.8 Data interface RS232/RS485 (Connection X9)

The standard device is designed with the serial RS232/RS485 data interface.

RS232			RS485		
PIN	X9		PIN	X9	
1	n.a.	Galvanically isolated (24 V).	1	TxD-P	Galvanically isolated.
2	n.a.		2	TxD-N	
3	TxD-V24		3	n.a.	
4	n.a.	Galvanically not isolated (230 V).	4	n.a.	2/4-wire.
5	n.a.		5	RxD-N	
6	n.a.	Only for purpose of configuration.	6	RxD-P	In the case of 2-wire operation: Connect Pin 1 and 6, as well as Pin 2 and 5.
7	n.a.		7	n.a.	
8	RxD-V24		8	n.a.	
9	GND-V24		9	n.a.	



The communication over serial data interface uses the protocol PSGII and Modbus. You are provided with a protocol description PSGII and Modbus (addressing, protocol frame, logging function) and the respective object list (zone and system parameters, which are stored for the controller type in the protocol) of the device, as a download, on request, or directly from the home page.

Configuration

The configuration of the communication over the serial data interface is implemented with the aid of the parameters listed under ->Serial data interface.

6.2.9 CAN-Bus (connection X10)

The options included in the device are to be taken from the ->Type designation.

PIN	X10 PSG-CAN	PIN	X10 CANopen
1	+U	1	n.a.
2	n.a.	2	CAN-L
3	n.a.	3	n.a.
4	n.a.	4	n.a.
5	GND	5	n.a.
6	n.a.	6	n.a.
7	CAN-L	7	CAN-H
8	n.a.	8	n.a.
9	CAN-H	9	n.a.



The communication over the CAN-Bus uses the protocol CANopen. You are provided with an object list (zone and system parameters which are stored for the controller type in the protocol) of the device, as a download, on request, or directly from the home page.

CAN-Bus termination: Connecting Pin3 and Pin4 on terminal X10 activates the internal CAN-Bus termination impedance of 120 Ohm.

Configuration

The configuration of the communication over the CAN-Bus interface is implemented with the aid of the parameters listed under ->CANBUS

6.2.10OPTION Profibus DP (Connection X8)

The options included in the device are to be taken from the ->*Type designation*.

PIN	X8
1	n.a.
2	n.a.
3	TxD-B
4	RTS
5	0V
6	+5VDC
7	n.a.
8	TxD-A
9	n.a.

The communication over the Profibus DP data interface uses the Profibus protocol DP. Should the protocol Profibus DPEA be used, the controllers with firmware 22, 23, 26, 27 must be used.



You are provided with a protocol description Profibus DP and Profibus DPEA (addressing, protocol frame, logging function) and the respective object list (zone and system parameters, which are stored for the controller type in the protocol) of the device, as a download, on request, or directly from the home page.

Configuration

The configuration of the communication over the Profibus interface is implemented with the aid of the parameters listed under Profibus DP.->*Profibus DP*

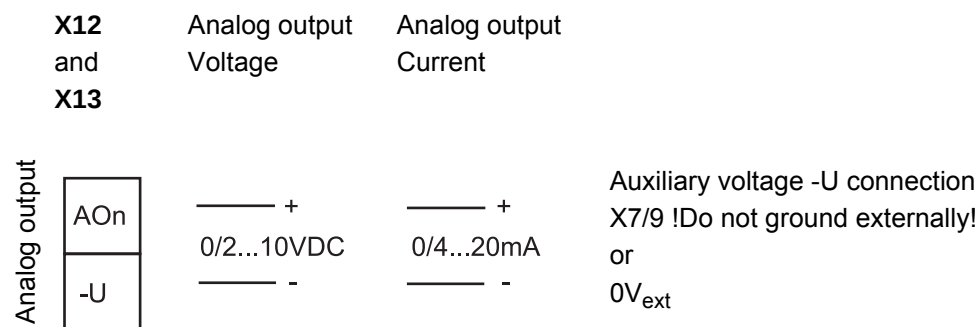
6.2.11OPTION Analog Outputs (Connection X12, X13)

The options included in the device are to be taken from the ->Type designation.

In the system setting is defined which values/function is output on the analog outputs and which lower limit value refers to the output range (0 or 4mA and/or 0 or 2VDC).

PIN	X12	X13
1	AO3	AO1
2	AO4	AO2
3...10	n.a.	n.a.
11	n.a.	+U
12	n.a.	-U

Terminal marking OLD=NEW



Adjustment analog output

Each analog output AO1...AO4 can be stipulated by jumper as analog output voltage (standard ex-works) or current. Under the casing there are 4 jumpers.

Ensuring voltage-free state



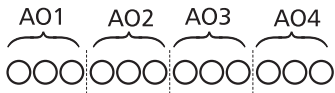
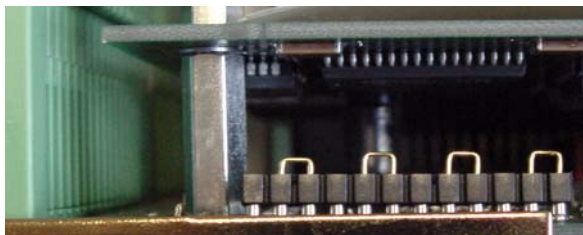
Before starting the setting of the analog outputs, attention is to be paid that the device is de-energized.

Step 1



Remove the 4 screws of the casing. Detach the casing carefully (if necessary remove terminal X7, X11 first).

Step 2



The jumper are on the left side of the device. The assignment of the 12 jumpers is done in four groups of 3, from the left side to the right. In this example AO1 to AO4 are stipulated as analog output for voltage.

Step 3

Voltage



Current



Analog output AO1-AO4 voltage/current by jumper adjustable.

Step 4

Attach the casing again and tighten the screws.

Configuration

Adjust measuring range of analog outputs.	->[SP46] AOFF/AOFF - Offset Analog Outputs
Stipulate function of the analog outputs.	->[SP47] AO1 /AO1 - Analog Output 1 ->[SP48] AO2 /AO2 - Analog Output 2 ->[SP49] AO3 /AO3 - Analog Output 3 ->[SP50] AO4 /AO4 - Analog Output 4

7 Addressing and Further Functions by DIP Switch

Using the DIP switch, the following configuration of the system and functions like e.g. acknowledgement can be carried out.

7.1 Addressing

The address consists of device ID (binary coded; setting by DIP switch) and an interface specific base part (setting by system parameter in engineering tool WinKonVis).

Based on the used firmware version (S and/or SD) for the serial interface can be chosen between static and dynamic addressing.

	Firmware Version SD Static/Dynamic Addressing Firmware Identifier	Firmware Version S Static Addressing Firmware Identifier
ETR112	20, 22, 24, 26	21, 23, 25, 27, 28, 2T

Firmware Version S

The device ID is adjusted by the DIP switches 1...4.

Firmware Version SD

The device ID is adjusted by the DIP switches 1...5.

The selection of the addressing type is done by DIP switch 6
(static: DIP switch 6 = OFF, dynamic: DIP switch 6 = ON).

Static Addressing of Serial Interface (Firmware Version S and/or SD & DIP 6 = OFF)

At static addressing 8 zones are addressed by 1 address.

For the controller the zone number is defined by 32. The 32 zones therefore reserve 4 addresses.

The address of the controller is dependent on the DIP switch a multiple of 4.

Dynamic Addressing of Serial Interface (Firmware SD & DIP 6 = ON)

At dynamic addressing 8 zones are addressed by one address.

For the controller ETR112 the zone number is defined by 32. The 32 zones therefore reserve 4 addresses. The DIP switch has to be set accordingly.

Interface	Resulting Address/NodeID		Base part of Address/NodeID
Serial PSGII/ Modbus RTU	Serial Address	=	Device ID by (DIP switch 1...4) x 4 at Firmware Version S (32 zones = 4 addresses)

	Serial Address	=	Device ID
	0	=	0
	4	=	1
	8	=	2
	etc.		etc.

Serial PSGII/ Modbus RTU	Serial Address	=	Device ID by (DIP switch 1...5) x 4 DIP switch 6 = OFF at Firmware Version SD - static (32 zones = 4 addresses)
--------------------------	----------------	---	---

	Serial Address	=	Device ID
	0	=	0
	4	=	1
	8	=	2
	etc.		etc.

Serial PSGII/ Modbus RTU	Serial Address	=	Device ID by (DIP switch 1...5) DIP switch 6 = ON at Firmware Version SD - dynamic (32 zones = 4 addresses)
--------------------------	----------------	---	---

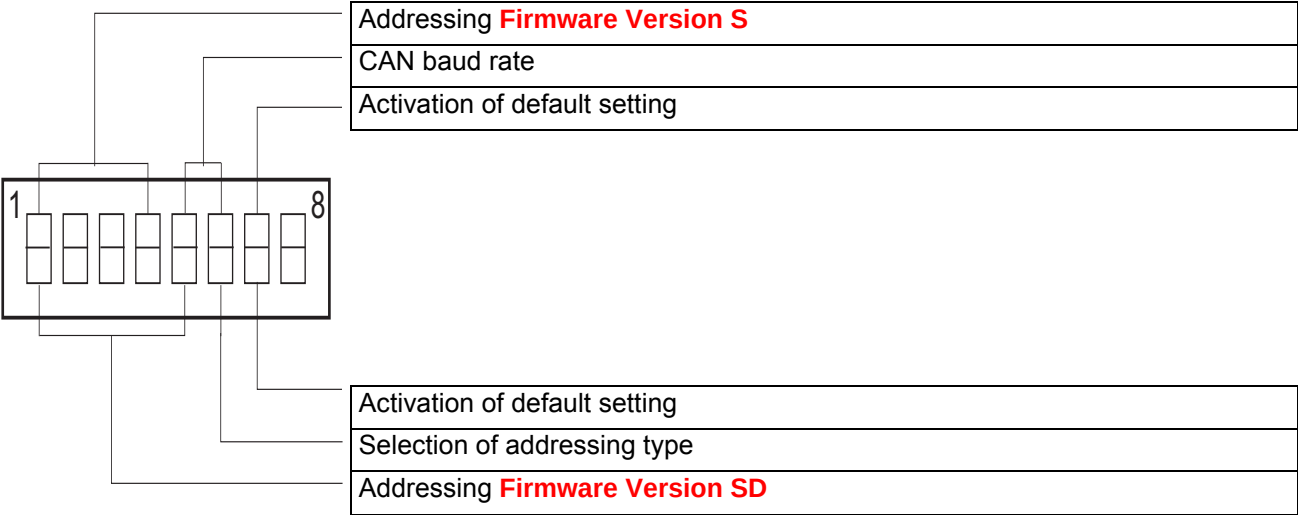
	Serial Address	=	Device ID
	0	=	0
	4	=	4
	8	=	8
	etc.		etc.

PSG-CAN	CAN-NodeID	=	CANopen base address CADR + device ID by (DIP switch 1...5, and/or 1...4)
---------	------------	---	---

CANopen	CAN-NodeID	=	CANopen base address CADR + device ID by (DIP switch 1...5, and/or 1...4)
Profibus DP & DPEA	Profibus DP Slave address	=	DPAD/DPAD < 128 Profibus DP Slave Address DPAD + Device ID by (DIP switch 1...5, and/or 1...4)
		=	DPAD/DPAD >= 128 Profibus DP slave address DPAD - 128

7.2 DIP switch

The DIP switch setting differs from firmware version to firmware version.



DIP 5...6

Baud rate CAN (only for firmware version S)



The setting of the CAN baud rate for firmware version SD is done by system parameter ->[SP05] CANB/CANB - CAN Baud Rate.

DIP 1...5 and 7

Default setting for CANopen



The default setting by system parameter CANB for CANopen is only valid for controllers with firmware version SD.

If the DIP switches 1...5, as well as DIP switch 7 = ON, the following default settings for CANopen are activated.

Default setting CANopen (X10):

- CANB = Default of manufacturer
- CADR = 32
- A-OP = ON
- OPEN = ON

DIP 7



Default Setting for Serial Interface

If the DIP switch 7 = ON, the following default settings for the serial interface are activated.

Default setting serial data interface (X9):
Address like set by DIP switch 1...5 and/or 1...4
Protocol PSGII
Baud rate 19200 Baud
No Parity
1 Stop bit

DIP 7



Acknowledge Error Messages

By setting of DIP switch 7 from OFF to ON (1.), waiting 3 seconds, and again to OFF (2.), the acknowledgement of pending error messages is initiated.

8 Status displays/diagnostics

8.1 Information 'zone text'

In case of certain operational states of the controller, a text is overlaid alternately with the actual value in the zone display of the operating and display units. This text can be read out under the byte ZoneFMode for every zone over all interfaces. The information is also designated as a zone text.

Since only the zone text with the highest priority can always be displayed, the zone text is to be considered exclusively as an extension to the status information of a zone. The byte ZoneFMode includes the following information:

Bit	on	off
0...5	Zone text -> <i>Overview of zone texts</i>	
6	Control zone has correct model of the control zone. At least a ->[P031] IDEN>IDEN - Heating Identification has been successfully carried out.	Control zone does not have any correct model of the control zone. No ->[P031] IDEN>IDEN - Heating Identification has yet been successfully carried out.
7	Zone active.	Zone passive.

8.1.1 Overview of zone texts

Signal flag (dec)	Display	Meaning	Alarm	Status
1	Ma	Manual mode		x
2	CoU	Leading zone manual mode		x
3	AbS	Reduction		x
4	rAP	Temperature Ramp		x
5	StA	Startup operation		x
6		Without function		
7	Id	Identification		x
8	IdC	Cooling adaptation		x
9	tCb	Sensor break	x	
10	TCAL	Sensor short-circuit	x	
11	tcP	Sensor incorrect polarity	x	
12	CAn	Fault in CAN communication	x	
13	Err	System error/ fault in channel data	x	
14	AL	Exceeded maximum temperature/ upper limit of measuring range	x	
15	PIId	Plausibility violation during the identification		x
16	drl	Drift error report during identification phase		x
17	IF	Error report "No heating current measured" during identification phase	x	
18	SP2	2nd setpoint value		x
19	SP3	3rd setpoint value		x
20	SP4	4th setpoint value		x
21	dF1	Fault "No current" determined in case of "Heating current" diagnostics	x	
22	dF2	Fault "Current on incorrect zone" determined in case of "Heating current" diagnostics		x
23	dF3	Fault "Current both on correct as well as on another zone" determined with "Heating current" diagnostics		x
24	dE	No fault determined with "Heating current" diagnostics / "Allocation sensor/ heating" diagnostics ends		x
25	dIA	Diagnostics function active		x

Signal flag (dec)	Display	Meaning	Alarm	Status
26	dF4	Fault "Alarm current with switched off heating" determined in case of diagnostics		x
27	Ar	Automatic ramp		x
28	Ar.	Automatic ramp active, zone with least temperature rise		x
29	I-	Alarm "Current alarm with heating off"	x	
30	ALS	Storing alarm function	x	
31	IdS	Automatic cooling adaptation started, however still not active		x
32-33		Without function		
34	000			
35	001	Error signal	x	
36	002	Module matching system error	x	
37	003	CPU adjustment fault	x	
38	004			
39	005	Fault in system data	x	
40	006			
41	007			
42	008	Switch-on configuration	x	
43	009	Switch-on configuration sensor	x	
44-49		Without function		
50	Out	Power controller disconnected (Digital Input 2 active and system parameter INPD equal to 0 or 1)		x
51	Cul	CAN error in data link controller/CANSTI	x	

8.2 System error

Unlike zone-specific faults (temperature limit values, heating current alarms, etc.) system errors identify faults on the controller itself. The system errors can be read out from the controller on the zone flags over all interfaces. Detailed information on this can be found in the object lists for the corresponding protocols.

The cause of error, the output of the OK-LED on the controller, the message text in the operating and display units, as well as notes on the elimination of the fault, are indicated below for all possible system errors.

Fault in the CPU basic matching

If the basic matching of the controller cannot be read correctly any longer, then the bit "Fault in the basic matching" is set.

- On all zones of the controller a degree of operation of 0% is output.
- On the OK-LED of the controller a flashing signal is output.
- With the operating and display units, ERR 003 is displayed.

For the removal of the fault, the controller is to be set to the ex-works state (Code Number 759). Before resetting into the ex-works state, all channel data and system data are to be noted down or read out and stored with WinKonVis.

Fault in the module matching

The module matching data items in the controller unit. If these cannot be read correctly any longer, then the bit "Fault in the module matching" is set.

- On all zones of the module, a degree of operation of 0% is output.
- If a "fault in the module matching" is identified for the zones 1 to 4, then two flashing signals are output at the OK-LED of the controller.
- If a "fault in the module matching" is identified for the zones 5 to 8, then three flashing signals are output at the OK-LED.
- If a "fault in the module matching" is identified for the zones 9 to 12, then four flashing signals are output at the OK-LED.
- If a "fault in the module matching" is identified for the zones 13 to 16, then five flashing signals are output at the OK-LED.
- With the operating and display units, ERR 002 is displayed.

For the removal of the fault, the controller is to be set to the ex-works state (Code Number 759). Before resetting into the ex-works state, all channel data and system data are to be noted down or read out and stored with WinKonVis.

Fault in channel data

For the assurance of the data consistency and the data security, a checksum is stored for every zone in case of storage of the configuration data into the EEPROM.

The bit „Fault in channel data“ is activated, when the controller detects a check sum error during reading of channel data.

- If a "Fault in channel data" is identified, seven flashing signals are output on the OK-LED.
- With the operating and display units, ERR is displayed in the zone display.

For the removal of the fault, all zone-specific configuration parameters are to be checked, a value changed and the change stored in the EEPROM. After this, wait 20 seconds and carry out a controller reset (e.g. over code number 999). After the regulator restart, the fault should have disappeared.

Alternatively, the controller can be set into the ex-works state (Code Number 759). Before resetting into the ex-works state, please note down all channel data and system data or read out and store with WnKonVis.

If the fault reappears after the reset, then there is a hardware fault in the EEPROM. The controller must be sent in for repair.

Fault in System data/ Attributes

The system data is stored grid-failure-secure in the EEPROM of the controller. The bit "Fault in system data/attributes" is set if data change without external intervention.

- On all zones of the controller a degree of operation of 0% is output.
- If a "Fault in system data/attributes" is identified, then six flashing signals are output on the OK-LED.
- With the operating and display units, ERR 005 is displayed.

For the removal of the fault, all system data and attributes are to be checked, a value changed and the changes taken over into the EEPROM. After this, wait 20 seconds and carry out a controller reset (e.g. over code number 999). After the regulator restart, the fault should have disappeared.

Alternatively, the controller can be set into the ex-works state (Code Number 759). Before resetting into the ex-works state, all channel data and system data are to be noted down or read out and stored with WinKonVis.

If the fault reappears after the reset, then there is a hardware fault in the EEPROM. The controller must be sent in for repair.

CAN-Bus fault

A fault CAN-Bus occurs, for example, when data which should be received by the controller over CAN-Bus controller (e.g. measured values of FIN 08 or CANAIN 08) does not reach the controller or CAN components corresponding to the controller cannot be identified by the controller.

- In case of a fault on the CAN-Bus, eight flashing signals are output on the OK-LED.
- In case of the operating and display units, CAN is displayed in the zone displays.

For elimination of the fault all cable connections, settings of CAN baud rate, address settings have to be checked.



Detailed information on the error location (among other things) can be found in the planning instructions of an ETS control system. You are provided with the document, on request, or directly as a download from the home page.

8.2.1 Summary of system errors / flashing codes OK-LED

Cause of error	Number of flashing signals	Display of operating and display units
Fault in the CPU basic matching	1	ERR 003
Fault in the module matching Zone 1 to 4	2	ERR 002
Fault in the module matching Zone 5 to 8	3	ERR 002
Fault in the module matching Zone 9 to 12	4	ERR 002
Fault in the module matching Zone 13 to 16	5	ERR 002
Fault in EEPROM		ERR 004
Fault in system data/ Attributes	6	ERR 005
Fault sensor type (A sensor type is adjusted for the device, that is not supported by the device/calibration. The error report can be acknowledged (see ->Addressing and Further Functions by DIP Switch). Check the setting of the sensor type after acknowledgement.		ERR 009
Fault in channel data	7	ERR
CAN-Bus fault	8	CAN

9 Configuration and adjustments

With the configuration parameters, zone (and/or channel) parameters and system parameters are distinguished between. Zone parameters are separately adjustable for every zone of the controller, while system parameters apply zone-independently for the entire controller.

Parameters are functionally collated in the description. The identification of a parameter is implemented over the following:

- the **designation** of the configuration parameter as zone [P***] and/or system parameter [SP**],
- a **characteristic analog** for the identification of the parameter in the parameter lists of the project planning and configuration tool WinKonVis
- The **parameter mnemonics** (German/English), which are employed for the identification in the operating and display units BA and in the project planning and configuration tool WinKonVis (WKV),
- the **parameter label**,
- the data type (Bit, Byte, Char, Word, Integer) and bytes occupied by the data type
- the setting range over the interfaces, WinKonVis and over the operating and display units BA (if these are identical, the setting range is indicated only once) and a multiplication factor that is to be considered.
- a unit (when existent)



- The ex-works basic setting of a parameter is identified through a bracket (e.g. [on]).
- The handling of, as well as the access to, the parameters over the data interfaces (serial interface [PSGII, MODBUS], CAN-Bus, Profibus DP [Standard, DPEA]) are to be taken from the protocol descriptions, as well as from the relevant parameter object lists.
- The maximum setting range of a parameter is stipulated through its data format. In general, the maximum possible setting range is functionally limited. This is indicated as a setting range for the interfaces.
- The detailed information on the data formats and ranges of values of the parameters are also to be found in the object lists to the interfaces.



Has the parameter for controllers with other firmware another characteristic analog, a further line is added and the appropriate firmware version is itemized.

9.1 Basic configuration

[P050] ZONE/ZONE - Zone
[P048] ZONE/ZONE - Zone
(For controller with firmware: 86, 88)

Data type	Bit
Adjustment range interfaces	[0], 1
Adjustment range WKV	[on], oFF
Adjustment range BA	[on], oFF



For reasons of compatibility to controllers of older generations, the adjustment value is over interface in reverse logic.

1	▪ At control output in accordance with operating mode (control/manual mode) actuating signals are output. ▪ All alarms are calculated.
[0]	▪ At control outputs no actuating signals are output. ▪ No alarms are calculated.

[P034] KHLG/COOL - 3-Point Operation

Data type	Bit
Adjustment range interfaces	0, [1]
Adjustment range WKV	oFF, [on]
Adjustment range BA	oFF, [on]

0	The control algorithm works in two-point operation (heating). The output range of the degree of operation in control and manual mode is 0...100%. At the heating control output, actuating signals are output at positive setting levels, at the cooling output no actuating signal is output.
[1]	The control algorithm works in three-position operation (heating/cooling). The output range of the degree of operation in control and manual mode is -100...100%. On the heating control output, actuating signals are output at positive setting levels and, on the cooling output the actuating signals are output at negative setting levels

[SP24] CELS/CELS - Temperature Unit °C/°F

Data type	Char
Adjustment range interfaces	0, [1]
Adjustment range WKV	°F, [°C]
Adjustment range BA	oFF, [on]

Unit of measurement signal.

The measured value is calculated directly in case of controllers with thermo-element and resistance thermometer inputs. In case of controllers with standard signal inputs, the calculation is implemented on the basis of the scaling parameters ->[P042] ANZ-/RG L - Lower Temperature Level at Standard Signal Inputs and ->[P043] ANZ+/RG - Upper Temperature Level with Standard Signal Inputs

[SP41] MAXK/MAXK – Maximum Number of Channels

Data type	Byte
Adjustment range interfaces, WKV, BA / multiplier	1...[32] / 1

The parameter stipulates the zone number for which the regulation, as well as the alarm handling, is processed, starting from the first zone. The reduction of the zone number does not have any effect on the cycle duration in case of recording of the measured values.

9.2 Configuration inputs

[SP20] SEN1/SEN1 - Sensor Type Zone 1...4

Data type	Byte
Adjustment range interfaces	[0]...5 / 1
Adjustment range WKV	0-[Fe-L], 1-Fe-J, 2-NiCr, 3-PT100, 4-Standard, 5-NI100
Adjustment range BA	[FEL], FEJ, niC, Pt, Str, niP

The parameter stipulates the type of the sensors which are connected to the measurement inputs of the corresponding zones.

- In case of controllers in the implementation TCPT, all eight measurement inputs can be switched over between thermo element types (Fe CuNi L, Fe CuNi J, Ni CrNi K, NiCrSi NiSi N) and resistance thermometers (Pt100).
- The measurement inputs of controllers in standard signal implementation U and I are not interchangeable. The sensor type is stipulated with ordering of the device and must be set adjusted according to the implementation.

[SP21] SEN2/SEN2 - Sensor Type Zone 5...8

Data type	Byte
Adjustment range interfaces	[0]...5 / 1
Adjustment range WKV	0-[Fe-L], 1-Fe-J, 2-NiCr, 3-PT100, 4-Standard, 5-Ni100
Adjustment range BA	[FEL], FEJ, niC, Pt, Str, niP

->[SP20] SEN1/SEN1 - Sensor Type Zone 1...4

[SP22] SEN3/SEN3 - Sensor Type Zone 9...12

Data type	Byte
Adjustment range interfaces	[0]...5 / 1
Adjustment range WKV	0-[Fe-L], 1-Fe-J, 2-NiCr, 3-PT100, 4-Standard, 5-Ni100
Adjustment range BA	[FEL], FEJ, niC, Pt, Str, niP

->[SP20] SEN1/SEN1 - Sensor Type Zone 1...4

[SP23] SEN4/SEN4 - Sensor Type Zone 13...16

Data type	Byte
Adjustment range interfaces	[0]...5 / 1
Adjustment range WKV	0-[Fe-L], 1-Fe-J, 2-NiCr, 3-PT100, 4-Standard, 5-Ni100
Adjustment range BA	[FEL], FEJ, niC, Pt, Str, niP

->[SP20] SEN1/SEN1 - Sensor Type Zone 1...4

[P029] OFFS/OFFS - Temperature Offset

Data type	Char
Adjustment range interfaces, WKV, BA / multiplier	-9.9...[0.0]...9.9 unit of the measured value / 10

The measured value of the measurement input is corrected as follows:

Corrected measured value = measured value + temperature offset OFFS + Offset Zone
...

(see OFF*)

[SP30] OFF1/OFF1 - Offset Zone 1...4

Data type	Char
Adjustment range interfaces, WKV, BA / multiplier	-9...[0]...9 unit of the measured value / 10

For the measurement inputs of the zones 1 to 4 the following applies:

Corrected measured value = measured value + temperature offset OFFS + Offset Zone
1...4

[SP31] OFF2/OFF2 - Offset Zone 5...8

Data type	Char
Adjustment range interfaces, WKV, BA / multiplier	-9...[0]...9 unit of the measured value / 10

For the measurement inputs of the zones 5 to 8 the following applies:

Corrected measured value = measured value + temperature offset OFFS + Offset Zone
5...8

[SP32] OFF3/OFF3 - Offset Zone 9...12

Data type	Char
Adjustment range interfaces, WKV, BA / multiplier	-9...[0]...9 unit of the measured value / 10

For the measurement inputs of the zones 9 to 12 the following applies:

Corrected measured value = measured value + temperature offset OFFS + Offset Zone 9...12

[SP33] OFF4/OFF4 - Offset Zone 13...16

Data type

Char

Adjustment range interfaces, WKV, BA / multiplier -9...[0]...9 unit of the measured value / 10

For the measurement inputs of the zones 13 to 16 the following applies:

Corrected measured value = measured value + temperature offset OFFS + Offset Zone 13...16

[P042] ANZ-/RG L - Lower Temperature Level at Standard Signal Inputs

Data type

Word

Adjustment range interfaces, WKV / multiplier -99...[0]...1300 unit of the measured value / 10

Adjustment range BA -99...[0]...999 unit of the measured value / 10

For a measurement input of type standard signal U or I direct on the controller, the parameter stipulates the value which is displayed in case of a measured value equal to 0/2 VDC and 0/4 mA.

Related with the parameter ->[P043] ANZ+/RG - Upper Temperature Level with Standard Signal Inputs a characteristic curve is defined, with its help the display values e.g. for an input of 0...10V are calculated as follows:

Display value = $0.1 \times (ANZ+ - ANZ-) \times \text{Measured value} + ANZ$



For measurement recording by CANAIN08/FIN08

- at APPL/APPL < 128 the actual value is not scaled
- at APPL/APPL ≥ 128 the display range of the actual value is defined by ANZ-RG L and/or ANZ+/RG H

->[P032] APPL/APPL - Application

Is a thermocouple TC and/or resistance thermometer Pt100 directly connected to the controller, the parameter is without function.

[P043] ANZ+/RG - Upper Temperature Level with Standard Signal Inputs

Data type

Word

Adjustment range interfaces, WKV / multiplier -99...[500]...1300 unit of the measured value / 10

Adjustment range BA -99...[500]...999 unit of the measured value

For a measurement input of type standard signal U or I direct on the controller, the parameter stipulates the value which is displayed in case of a measured value equal to 10 VDC and 20 mA.

->[P042] ANZ-/RG L - Lower Temperature Level at Standard Signal Inputs



For measurement recording by CANAIN08/FIN08

- at APPL/APPL < 128 the actual value is not scaled
- at APPL/APPL ≥ 128 the display range of the actual value is defined by ANZ-RG L and/or ANZ+/RG H

->[P032] APPL/APPL - Application

Is a thermocouple TC and/or resistance thermometer Pt100 directly connected to the controller, the parameter is without function.

[P057] NrIW/NoZN - Zone Allocation to Measurement Input on Sensor Interface FIN

[P051] NrIW/NoZN - Zone Allocation to Measurement Input on Sensor Interface FIN

(For controller with firmware: 86, 88)

Data type

Integer

Adjustment range interfaces, WKV, BA / multiplier [0]...511 / 1

0	The zone uses the measurement input assigned directly on the controller (Zone X - Measurement Input X)
>0	The zone uses the measurement input on a CANAIN08 or FIN08. Setting value dependent on address of the CANAIN08/FIN08: Measurement input = (Address of the CANAIN08/FIN08 x 8) + (Measuring channel on CANAIN08/FIN08)  Zone 1 employs fifth measuring channel on a CANAIN08/FIN08 with address 2: Setting adjustment = (2 x 8) + 5 = 21 in case of Zone 1

[SP25] INPD/INPD - Function of Digital Inputs

Data type

Char

Adjustment range interfaces, WKV, BA / multiplier [0]...99 / 1



- For setting < 100 the parameter is compatible to parameter INP1 / 2 of controllers ETR132net, ETR112net and ETS132net.

	Digital Input 1	Digital Input 2	Digital Input 1 and 2
0	Regulation on 2. setpoint value	Heating actuator disconnected	
1	Relative reduction by 2. setpoint value	Heating actuator disconnected	
2	Regulation on 2. setpoint value	Regulation on 3. setpoint value	Regulation on 3. setpoint value
3	Relative reduction by 2. setpoint value	Relative reduction by 3. setpoint value	Relative reduction by 3. setpoint value
4	Regulation on 2. setpoint value	Regulation on 3. setpoint value	Regulation on 4. setpoint value
5	Relative reduction by 2. setpoint value	Relative reduction by 3. setpoint value	Relative reduction by 4. setpoint value
6	Regulation on 2. setpoint value	Reset-acknowledge stored alarms	
7	Relative reduction by 2. setpoint value	Reset-acknowledge stored alarms	
8	Regulation on 2. setpoint value	Start program function	
9	Relative reduction by 2. setpoint value	Start program function	
10	Regulation on 2. setpoint value	Regulation on 3. setpoint value	Regulation on 2. setpoint value
11	Relative reduction by 2. setpoint value	Relative reduction by 3. setpoint value	Relative reduction by 2. setpoint value
12	Regulation on 2. setpoint value (Zones 1-16)	Regulation on 2. setpoint value (Zones 17-32)	
13	Reduction relative by 2. setpoint value (Zones 1-16)	Reduction relative by 2. setpoint value (Zone 17-32)	
14	Regulation on 2. setpoint value	Regulation on 3. setpoint value	Start diagnostic function for sensor/heating
15	Relative reduction by 2. setpoint value	Relative reduction by 3. setpoint value	Start diagnostic function for sensor/heating
16	Relative reduction by 2. setpoint value	Setpoint value increase relative by 3. setpoint value	Setpoint value increase relative by 3. setpoint value

	Digital Input 1	Digital Input 2	Digital Input 1 and 2
17	Relative reduction by 2. setpoint value	Setpoint value increase relative by 3. setpoint value	Start diagnostic function for sensor/heating
18	Relative reduction by 2. setpoint value	Time-controlled setpoint value increase relative by 3. setpoint value	
19	Percentage reduction/increasing by 2. setpoint value	Percentage reduction/increasing by 3. setpoint value	Percentage reduction/increasing by 4. setpoint value
20	Regulation on 2. setpoint value	Disconnected heating actuator, signal low active	Instant group release
21	Relative reduction by 2. setpoint value	Disconnected heating actuator, signal low active	Instant group release
22	Regulation on 2. setpoint value	Regulation on 3. setpoint value	Passivate all zones
23	Relative reduction by 2. setpoint value	Relative reduction by 3. setpoint value	Passivate all zones
24	Heating actuator disconnected (Zones 1-16), signal high active	Heating actuator disconnected (Zones 17-32), signal high active	
25	Heating actuator disconnected (Zones 1-16), signal low active	Heating actuator disconnected (Zones 17-32), signal low active	
26	Regulation on 2. setpoint value	Start program function	Passivate all zones
27	Relative reduction by 2. setpoint value	Start program function	Passivate all zones
28	Degree of operation boost (degree of operation = 100%) for 10 seconds	Activate BA input block	
29	Reset-acknowledge stored alarms	Activate BA input block	
30	Regulation on 2. setpoint value	Disconnected heating actuator, signal low active	
31	Relative reduction by 2. setpoint value	Disconnected heating actuator, signal low active	
32... 35	n.a.	n.a.	n.a.
36 *)	Relative reduction by 2. setpoint value	Relative reduction by 3. setpoint value	Relative reduction by 3. setpoint value
37 *)	Positive edge activates Standby after 5 minutes	Relative increasing by 3. setpoint value	Positive edge activates Standby after 5 minutes
38... 39	n.a.	n.a.	n.a.
40	Regulation on 2. setpoint value	Instant group release when 2. setpoint value < setpoint value.	
41	Relative reduction by 2. setpoint value	Instant group release	
42... 99	n.a.	n.a.	n.a.

*)For controller with firmware: 86, 88

9.3 Configuration/Functions Outputs

[P002] STGR/OPWR - Degree of Operation

Data type

Char

Adjustment range interfaces, WKV, BA / multiplier -100...[0]...100 % / 1

Actuating variable. Calculated in the standard operation through controllers. In the manual mode, the specification is implemented manually by the operator.

->[P003] STBE/MANU - Manual Mode

[P035] RELH/RELH - RELH/RELH - Heating Relay Output

Data type

Bit

Adjustment range interfaces

[0], 1

Adjustment range WKV

[oFF], on

Adjustment range BA

[oFF], on

Stipulates the manner in which the actuating signal is output at the Heating control output. Through this, an adaptation of the actuating signal to the actuator (SSR, relay) is possible.

0	Output of the actuating variable through fast clocked pulse groups (e.g. for the output to solid state relay). The minimum pulse width is 40 ms.
1	Per sampling cycle (corresponds to sampling time) the actuating variable is output in the block (one-time switching on and off of the setting output). The operating time is proportional to the degree of operation with reference to the sampling time. In order to take care of the actuator the ->[P014] TA-H /CT-H - Heating Sampling Time is set to a minimum of 10 seconds.

[P036] RELK/RELC - Cooling Relay Output

Data type

Bit

Adjustment range interfaces

0, [1]

Adjustment range WKV

oFF, [on]

Adjustment range BA

oFF, [on]

Stipulates the type of the output of the actuating signal at the cooling control output. Used for the adaptation of the actuating signal to the actuator (SSR, relay).

0	Output of the actuating variable through fast clocked pulse groups (e.g. for the output to solid state relay). The minimum pulse width is 40 ms.
1	Per sampling cycle (corresponds to sampling time) the actuating variable is output in the block (one-time switching on and off of the setting output). The operating time is proportional to the degree of operation with reference to the sampling time. The ->[P018] TA-K /CT - Cooling Sampling Time is limited to a minimum of 10 seconds.

[SP46] AOFF/AOFF - Offset Analog Outputs

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0]...15 / 1

0	The lower measuring range limit of the analog outputs is 0 VDC or 0 mA.
1	The lower measuring range limit of the analog outputs is 2 VDC or 4 mA.

[SP47] AO1 /AO1 - Analog Output 1

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier -32...[0]...32 / 1

Stipulation as to which actuating signal is output from which zone on the Analog Output 1.

0	Analog output is not assigned to any zone. The minimum value of the analog signal is output from the analog output.
>0	Number of the zone from which a value, which is proportional to the heating degree of operation, is output on the analog output; the degree of operation=0%, corresponds to the minimum value of the analog output; the degree of operation=100% corresponds to the maximum value of the analog output
<0	A value, which is proportional to the cooling degree of operation, is output on the analog output from corresponding zone. The degree of operation=0% corresponds to the minimum value of the analog output; the degree of operation=-100% corresponds to the maximum value of the analog output.

[SP48] AO2 /AO2 - Analog Output 2

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier -32...[0]...32 / 1

->[SP47] AO1 /AO1 - Analog Output 1

[SP49] AO3 /AO3 - Analog Output 3

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier -32...[0]...32 / 1

->[SP47] AO1 /AO1 - Analog Output 1

[SP50] AO4 /AO4 - Analog Output 4

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier -32...[0]...32 / 1

->[SP47] AO1 /AO1 - Analog Output 1

[SP51] DIO /DIO - Digital Inputs / Outputs

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Stipulates the function of the digital inputs/outputs on Terminal X13

0	Without Function.
1	Test function. The signal of the corresponding digital input is output on the digital output.
2	Control of the digital outputs over the data interfaces.
3	Alarm outputs of melt pressure application. Signal low active, i.e. voltage is output at output when alarm not active. Output 1: Pre-alarm Zone 13 Output 2: Master alarm Zone 13 Output 3: Pre-alarm Zone 14 Output 4: Master alarm Zone 14 ->[P032] APPL/APPL - Application
4	Alarm outputs of melt pressure application. Signal high active, i.e. voltage is output at output in case of active alarm. Output 1: Pre-alarm Zone 13 Output 2: Master alarm Zone 13 Output 3: Pre-alarm Zone 14 Output 4: Master alarm Zone 14 ->[P032] APPL/APPL - Application

[SP52] ODEF/ODEF - Definition of Control Outputs

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0]...3 / 1

For the adaptation to the application, the control outputs of the controller can be configured in different combinations (number of the heating/cooling zones).

0	12 Heating/ Cooling zones: Outputs 1-12: Control outputs heating Zone 1-12 Outputs 13-24: Control outputs cooling Zone 1-12
1	8 Heating zones and 8 heating/cooling zones: Outputs 1-16: Control outputs heating Zone 1-16 Outputs 17-24: Control outputs cooling Zone 1-8
2	16 Heating zones and 4 heating/cooling zones: Outputs 1-20: Control outputs heating Zone 1-20 Outputs 21-24: Control outputs cooling Zone 1-4
3	24 Heating zones: Outputs 1-24: Control outputs heating Zone 1-24

The outputs are assigned to the zones sequentially according to the configuration, starting from Output 1.

[P019] STGH/OUTH - Heating Degree of Operation Damping

Data type

Char

Adjustment range interfaces, WKV, BA / multiplier 0...[100] % / 1

Correction of the heating degree of operation:

Corrected degree of operation = degree of operation x 0.01 x setting value



Setting value STGH/OUTH = 75

Uncorrected degree of operation = 85%

Corrected degree of operation = 85% x 0.01 x 75 = 63% (rounded)

[P020] STGK/OUTC - Cooling Degree of Operation Damping

Data type

Char

Adjustment range interfaces, WKV, BA / multiplier 0...[100] % / 1

Correction of the degree of operation cooling:

Corrected degree of operation = degree of operation x 0.01 x setting value



Setting value STGK/OUTC = 75

Uncorrected degree of operation = -40%

Corrected degree of operation = -40% x 0.01 x 75 = -30%

[P021] STG%/OUT% - Maximum Degree of Operation in Manual Mode

Data type

Char

Adjustment range interfaces, WKV, BA / multiplier 0...[100] % / 1

Limitation of the maximum heating degree of operation in manual mode. Can be set e.g. as a safety function for the function ->[P033] FBA /TC-A - Manual Mode after Sensor Break.

9.4 Basic Functions

[P003] STBE/MANU - Manual Mode

Data type	Bit
Adjustment range interfaces	[0], 1
Adjustment range WKV	[oFF], on
Adjustment range BA	[oFF], on

[0]	Regulation active. Degree of operation is calculated from the control algorithm.
1	Regulation deactivated. Manual specification of the ->[P002] STGR/OPWR - Degree of Operation. In manual mode, a zone, e.g. in case of a defect of the measuring means (e.g. sensor break with thermo-couple) can be further operated in emergency operation. In manual mode the alarms are further monitored and the heating current monitoring also continues to function.

->[P033] FBA /TC-A - Manual Mode after Sensor Break

[P024] ANFB/STMO - Startup Operation

Data type	Bit
Adjustment range interfaces	[0], 1
Adjustment range WKV	[oFF], on
Adjustment range BA	[oFF], on

Function for temperature control field of application of hot conduit systems for the dehydrating of heating elements after start of temperature control.

If, after a reset of the controller

- in case of an active zone
- whose setpoint value is greater than 100°C

a temperature actual value is identified less than 90°C, the time set adjusted under ->[P025] ANFZ/STT - Startup Operation Initiation Timeis controlled to 100°C. The time starts when the actual values of all zones of the controller, with which the startup operation is activated, have been one-time in the tolerance band of the startup setpoint value of 100°C.

In case of networking of several controllers over CAN, the function works with controller-overall effect.

[P025] ANFZ/STT - Startup Operation Initiation Time

Data type	Byte
Adjustment range interfaces, WKV, BA / multiplier	[0]...99 minutes / 1

->[P024] ANFB/STMO - Startup Operation

[P049] NrFZ/NoCO - Leading Zone

[P047] NrFZ/NoCO - Leading Zone
(For controller with firmware: 86, 88)

Data type	Byte
Adjustment range interfaces, WKV, BA / multiplier	[0]...255 / 1

Function used to control the zone with the degree of operation of another zone. It is used e.g. in case of defect of the error sensing device corresponding to the zone (e.g. sensor break). In order to maintain the operation of the control zone in spite of that, the zone in the leading zone operation is operated with the degree of operation of a similar zone.

[0]	Leading zone operation deactivated. Zone employs its own degree of operation calculated through the regulation or stipulated manually.
-----	--

>0	The zone employs the degree of operation of the zone stipulated in the setting value. Since the function works with controller-overall effect (Prerequisite: Controller connected over CAN) the controller address is a component part of the setting value: Leading zone NrFZ/NoCO = (DIP switch setting x 32) + zone number  In the case of a zone with defective sensor, the degree of operation of the fifth zone of the controller should be employed as leading zone, with which the addressing DIP Switches 1 and 2 are set to on (corresponds to Address 3): NrFZ/NoCO = (3 x 32) + 5 = 101 The degree of operation output is completely synchronous, if - the zone is located on the same controller - the ->[P048] K-FZ/K-CO - Amplification Factor for Leading Zone is set equal to 0 If both conditions are not fulfilled, an asynchronous output of the degree of operation signal is then implemented.  A cascading of the leading zone is not permissible. In case of invalid inputs (when e.g. a zone is entered as a leading zone which itself has a reference to a leading zone), the setting value is set automatically to 0.
----	---

[P048] K-FZ/K-CO - Amplification Factor for Leading Zone**[P046] K-FZ/K-CO - Amplification Factor for Leading Zone
(For controller with firmware: 86, 88)**

Data type

Char

Adjustment range interfaces, WKV, BA / multiplier -99...[0]...100 % / 1

Enables the adaptation of the degree of operation of the leading zone for the zone led.

Adapted degree of operation = degree of operation + (1 + (0.01 x K-FZ))



The degree of operation of the leading zone should basically be increased by 10%: K-FZ/K CO = 10

In the case of a degree of operation of the leading zone of 50%, the following corrected degree of operation is calculated:

Adapted output value = 50% * (1 + (0.01 x 10)) = 55%

->[P049] NrFZ/NoCO - Leading Zone

[P044] TRMP/TRMP - Temperature Ramp

Data type

Word

Adjustment range interfaces, WKV, BA / multiplier [0.0]...99.9 Unit of the measurement input/minute / 10

Characteristic behavior of the setpoint value at setpoint value changes.

[0.0]	In case of setpoint value jump with setpoint value increases and setpoint value decreases.
>0.0	In case of setpoint value increases, the setpoint value is ramped with the setting value to the final setpoint value, starting from the current actual value. Setpoint value jump with setpoint value decreases.

[P045] ARMP/ARMP - Automatic Temperature Ramp

Data type

Bit

Adjustment range interfaces

[0], 1

Adjustment range WKV

[oFF], on

Adjustment range BA

[oFF], on

[0]	In the case of the zone, the automatic ramp operation is deactivated.
1	In the case of the zone, the automatic ramp operation is activated.

All active zones assigned to a group ->[P058] GPNr/GPNo - Group Number with a setpoint value greater than 100°C/32°F, with which the automatic ramping function is activated, are heated up at a setpoint value change >

30 °C automatically with respect to the actual value of the zone with the least rate of rise. The zone with the least rate of rise is called the reference zone.

With the aid of the function, mechanical stresses through large temperature gradient between zones of different rate of rise can be avoided.

In case of networking of several controllers over CAN, the function works with controller-overall effect.

- The automatic ramping function can also be employed in combination with the ->[P031] IDEN>IDEN - Heating Identification. With that, the uniform warming is implemented also in the case where the controller does not yet have any knowledge about the control zone and where this will be first calculated on the basis of the identification which progresses parallel to the automatic ramp.
- If the temperature difference of a zone to the reference zone is at least 30 Kelvin, or if no heating current is measured by a zone any longer, the zone is taken from the link of the automatic ramp after a time of 20 seconds.
- The automatic ramp requires one (at least once) executed identification Heating.

[SP28] AGAP/GAP - Tolerance Band for Automatic Ramp

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier 0...[5]...20 / 1

Unit of the measurement input
Stipulation of the tolerance band indicating how much the measured values of the zones may differ in automatic ramp operation. Zones which exceed the tolerance range are trimmed in the degree of operation.

[P033] FBA /TC-A - Manual Mode after Sensor Break

Data type Bit
Adjustment range interfaces [0], 1
Adjustment range WKV [oFF], on
Adjustment range BA [oFF], on

Stipulates the characteristic behavior of the zone in the case of a sensor break.

[0]	Function is deactivated.
1	At sensor break it is automatically switch to manual mode. The output value is calculated dependent on the mean output value from the last cycles before sensor break.



Sensor break during heating-up can lead to overheating when automatic transfer of degree of operation, because in this phase the maximal degree of operation is output. A limitation for the degree of operation in manual mode can be set by parameter ->[P021] STG%/OUT% - Maximum Degree of Operation in Manual Mode.

[P037] FAL /TCAL - Sensor Short-Circuit Monitoring

Data type Bit
Adjustment range interfaces [0], 1
Adjustment range WKV [oFF], on
Adjustment range interfaces & BA [oFF], on

Complex, dynamic monitoring function of the measuring element (sensor) per zone. The function helps to identify (as well as the static monitoring on sensor break and sensor incorrect polarity) to avoid additional error states in the area of the sensor and damage to the control zone e.g. through overheating.

An TCAL alarm is output, when

- no identification is running
- at active heating current monitoring (ADEF/AMPD <> 0, ASOL/AMPN > 0, ATOL/AMPT > 0)
- no current alarm is pending

Two causes can result in a TCAL alarm:

- If the difference between current actual value and the last sampled actual value is in between some sampling steps greater than 30 K, then a TCAL alarm is immediately triggered after a pre-determined number of control cycles, since, with this actual value characteristic, it must involve a defect on the sensor line or on the sensor.
- If the temperature actual value does not increase by 4 K in standard operation in case of maximum degree of operation (->[P019] *STGH/OUTH - Heating Degree of Operation Damping*) within a pre-determined time, then a TCAL alarm is triggered.

The response time of the sensor short-circuit monitoring is derived automatically from the sampling time of the zone.

Due to the response time, mistakenly triggered TCAL alarms are reduced. The response time is started at the time when all prerequisites for a TCAL alarm are satisfied. The response time is reset when one of the prerequisites for a TCAL is not satisfied during the response time.

According to the operating point, different TCAL response times are worked with:

- in the setpoint value band: TCAL response time = 30 x heating sampling time
- outside of the setpoint value band: TCAL response time = 20 x heating sampling time
- minimal response time (for TA-H/CT-H < 15 seconds): TCAL response time = 20 x 15 seconds

The setpoint value band is derived directly from the ->[P011] *XP-H /XP-H - Heating Proportional Band*:

$SWB = XPH \times 4$

9.5 Setpoint Value Functions

[P001] SOLL/SP - Setpoint Value

Data type	Integer
Adjustment range interfaces, WKV / multiplier	[0.0]...1300.0 Unit of the measurement input / 10
Adjustment range BA	[0]...999 Unit of the measurement input

Unit of the measurement input

Main setpoint value on which control is implemented when 2., 3. or 4. setpoint value not active.

- With setpoint value 0°C/32°F, the zone is passivated. Only the current alarm at "switched off heating" continues to be monitored.
- With setpoint value 0°C/32°F, the control algorithm is reinitialized
- With active manual mode, the setpoint value is without function.

[P008] 2SOL/SP2 - 2. Set Point/2. Lowering Value

Data type	Integer
Adjustment range interfaces, WKV / multiplier	[0.0]...1300.0 Unit of the measurement input / 10
Adjustment range BA	[0]...999 Unit of the measurement input

The second setpoint value is employed either (a) directly as a setpoint value or (b) as a setpoint value in the program function.

(a) Directly as a setpoint value

The second setpoint value is activated

- over a digital input for all zones simultaneously
- over the data interfaces for every zone separately.

aktiviert.

Over the parameter ->[SP25] INPD/INPD - Function of Digital Inputs is stipulated, whether

- control is implemented on a second setpoint value or whether
- control is implemented on the ->[P001] SOLL/SP - Setpoint Value reduced by the lowering value.

The reduction over digital input has a higher priority than the zone-specific software reduction.

b) As a setpoint value in the program function

The controller has a program function. With this, an arbitrary setpoint value profile can be realized with the four setpoint values.

If the program function should be used, then

- the ->[P024] ANFB/STMO - Startup Operation must be deactivated.
- the system parameter ->[SP25] INPD/INPD - Function of Digital Inputs is adjusted to 8 or 9.

The program function is started by the negative signal edge at the digital input 2.

The following setpoint value profile will run:

- ->[P008] 2SOL/SP2 - 2. Set Point/2. Lowering Value with->[P026] AFZ2/STT2 - Start-up Time of 2. Set Point/2. Lowering Value
- ->[P009] 3SOL/SP3 - 3. Set Point/3. Lowering Value with->[P027] AFZ3/STT3 - Start-up Time of 3. Set Point/3. Lowering Value
- ->[P010] 4SOL/SP4 - 4. Set Point/4. Lowering Value with->[P028] AFZ4/STT4 - Start-up Time of 4. Set Point/4. Lowering Value

The start-up time for the 2. setpoint value is not started until the actual values

- of all active zones
- whose setpoint value is not equal to 0°C

have reached the tolerance band around the second setpoint value. That is, the start-up time for the second setpoint value is not started until the "slowest" zone reaches the tolerance band around the second setpoint value.



It is to be ensured that the actual value can reach the tolerance band, because otherwise the program function will never be started.

[P009] 3SOL/SP3 - 3. Set Point/3. Lowering Value

Data type

Integer

Adjustment range interfaces, WKV / multiplier

[0.0]...1300.0 Unit of the measurement input / 10

Adjustment range BA

[0]...999 Unit of the measurement input

->[P008] 2SOL/SP2 - 2. Set Point/2. Lowering Value

[P010] 4SOL/SP4 - 4. Set Point/4. Lowering Value

Data type

Integer

Adjustment range interfaces, WKV / multiplier

[0.0]...1300.0 Unit of the measurement input / 10

Adjustment range BA

[0]...999 Unit of the measurement input

->[P008] 2SOL/SP2 - 2. Set Point/2. Lowering Value

[P022] SOL-/SPLO - Lower Setpoint Value Limit

Data type

Integer

Adjustment range interfaces, WKV / multiplier

[0.0]...1300.0 Unit of the measurement input / 10

Adjustment range BA

[0]...999 Unit of the measurement input

Lower input limitation for all temperature setpoints.

[P023] SOL+/SPHI - Upper Setpoint Value Limit

Data type

Integer

Adjustment range interfaces, WKV / multiplier

0.0...[500.0]...1300.0 Unit of the measurement input / 10

Adjustment range BA

0...[500]...999 Unit of the measurement input

Upper input limitation for all temperature setpoints.

Exceeding the upper setpoint value limit an alarm is activated, when

(Temperature actual value > SOL+/SPHI + 5K)

An alarm suppression is performed, when

SOL+/SPHI < 150 °C

[P026] AFZ2/STT2 - Start-up Time of 2. Set Point/2. Lowering Value

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier

[0]...99 minutes / 1

The setting value 0 deactivates the start-up time of the second setpoint value and/or the second lowering value.

->[P008] 2SOL/SP2 - 2. Set Point/2. Lowering Value

[P027] AFZ3/STT3 - Start-up Time of 3. Set Point/3. Lowering Value

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier

[0]...99 minutes / 1

The setting value 0 deactivates the start-up time of the third setpoint value and/or the third lowering value.

->[P026] AFZ2/STT2 - Start-up Time of 2. Set Point/2. Lowering Value

->[P008] 2SOL/SP2 - 2. Set Point/2. Lowering Value

[P028] AFZ4/STT4 - Start-up Time of 4. Set Point/4. Lowering Value

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...99 minutes / 1

The setting value 0 deactivates the start-up time of the fourth setpoint value and/or the fourth lowering value.

->[P026] AFZ2/STT2 - Start-up Time of 2. Set Point/2. Lowering Value

->[P008] 2SOL/SP2 - 2. Set Point/2. Lowering Value

9.6 Control characteristic

The automatic calculation of the control parameters comes about through the so-called identification in case of setpoint value changes, above a pre-determined height. The calculation of the control parameters cooling is coupled with the calculation of the heating control parameters.

[P011] XP-H /XP-H - Heating Proportional Band

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier 0.0...[9.9]...25.0 % / 10

The P content changes the output of the PID controller proportional to the deviation between setpoint and actual value.

The proportional band is the range of the process variable, in which this linear reinforcement occurs before the output achieves its maximum or minimum. This range is indicated in percent of the measuring range. In order that the adjusted proportional band is independent of the sensor type and/or measuring range, the controller measuring range in case of controllers is assumed at 500°C (1% corresponds to 5 K).

The amplification of the controller decreases with increasing proportional band, and increases with decreasing proportional band. In case of a proportional band selected too small, the controller reacts to small deviations so severely that the control system oscillates. On the other hand, a proportional band which is selected too large makes the regulation very slow. The controller no longer reacts adequately to faults. In case of utilization of pure proportional band controllers in the control system, the deviation cannot be eliminated fully. There results the so-called permanent deviation.

[P012] TD-H /TD-H - Heating Derivative Time

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier 0...[2]...255 seconds / 1

The differential content (D content) of the PID controller reacts in a leading way to the rate of change of the deviation or the actual value.

The differential content then supplies only a actuating variable, if the deviation or the actual value is changed. Therefore it cannot be used in order to stabilize a constant control deviation. That also explains the utilization of the D regulator only in association with P or PI characteristic.

The importance of the differential content in practice lies in the fact that the controller supplies actuating variables when the deviation first arises. The D characteristic makes the controller more rapid than a pure P or PI controller. However, the D characteristic cannot distinguish between real deviations and so-called hum disturbances, i.e. higher frequency superpositions on the measurement variable. A differential content which is set adjusted too large reacts to the disturbances with fast changes of the actuating variable, through which the control system becomes very unsteady.

[P013] TI-H /TI-H - Heating Integral Time

Data type Word
Adjustment range interfaces, WKV / multiplier 0...[9]...1275 seconds / 1
Adjustment range BA 0...[9]...999 seconds

With the integral content (I content) of the controller, a continuous change of the controller output value is achieved until the permanent deviation is stabilized to zero. With this, a permanent deviation is prevented.

The speed with which the stabilizing of the deviation happens and/or the influence of the I content on the actuating signal, is a function of the integral time (also: Integral time). A short integral time means a great influence of the I content on the setting value, i.e. it is integrated fast. A large integral time performs in reverse.

If the proportional band is changed, this also means a changed time-related characteristic with unchanged integral time.

The maximum of the $\rightarrow[P031] \text{ IDEN/IDEN - Heating Identification}$ calculated parameter value is 1275

[P014] TA-H /CT-H - Heating Sampling Time

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...60 seconds / 1

The sampling time defines a time period after which a $\rightarrow[P002] \text{ STGR/OPWR - Degree of Operation}$, which is recalculated from the control algorithm is output at the control output.

The sampling time is directly dependent on the dynamics of the controlled system and it is directly stipulated at the beginning of the $\rightarrow[P031] \text{ IDEN/IDEN - Heating Identification}$

[P015] XP-K /XP-C - Cooling Proportional Band

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier 0.0...[9.9]...25.0 % / 10

$\rightarrow[P011] \text{ XP-H /XP-H - Heating Proportional Band}$

[P016] TD-K /TD-C - Cooling Derivative Time

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier 0...[2]...255 seconds / 1

$\rightarrow[P012] \text{ TD-H /TD-H - Heating Derivative Time}$

[P017] TI-K /TI-C - Cooling Integral Time

Data type Word
Adjustment range interfaces, WKV / multiplier 0...[9]...1275 seconds / 1
Adjustment range BA 0...[9]...999 seconds

$\rightarrow[P013] \text{ TI-H /TI-H - Heating Integral Time}$

[P018] TA-K /CT - Cooling Sampling Time

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...60 seconds / 1

$\rightarrow[P014] \text{ TA-H /CT-H - Heating Sampling Time}$

[P030] ONLK/ONLC - Online Control

Data type Bit
Adjustment range interfaces 0, [1]
Adjustment range WKV oFF, [on]
Adjustment range BA oFF, [on]

0	Without Function.
---	-------------------

[1]	After the calculation of the control parameters through the $\rightarrow$[P031] IDEN>IDEN - Heating Identification the characteristic behavior of the control zone is compared with the characteristic behavior of one controller-internal-filed model of the controlled system. In case of deviations of the characteristic behavior from real controlled system and the section model, the control parameters are corrected appropriately.  The control parameters heating are not modifiable. They are overwritten immediately again through the control parameters calculated from the section model.
-----	---

[P031] IDEN>IDEN - Heating Identification

Data type	Bit
Adjustment range interfaces	0, [1]
Adjustment range WKV	oFF, [on]
Adjustment range BA	oFF, [on]

0	The controller controls with the adjusted control parameters heating. At no phase are the control parameters heating calculated.
[1]	After a zone reset, i.e. ■ controller is switched on ■ zone was passivated and is activated ■ setpoint value less than or equal to 0°C / 32 K the control parameters heating are calculated automatically during the first setpoint value increase greater than 50 K with heating.

The calculation of the control parameters cooling is dependent on the regulation procedure.

A cooling identification is implemented, when

- $\rightarrow$ [P031] IDEN>IDEN - Heating Identification = on
- $\rightarrow$ [P034] KHLG/COOL - 3-Point Operation = on
- $\rightarrow$ [P040] PAKF/CFIX - Cooling Parameter Fixed (Heating Identification) = off

after a setpoint value change greater than -30 K

Basically the calculation of the control parameters cooling are always started through an automatic cooling identification, when activated through Code Number 111.

[P040] PAKF/CFIX - Cooling Parameter Fixed (Heating Identification)

Data type	Bit
Adjustment range interfaces	[0], 1
Adjustment range WKV	[oFF], on
Adjustment range BA	[oFF], on

[0]	■ For identification heating the control parameters cooling are recalculated without carrying out an adaptation cooling. Basis for the control parameters cooling are the control parameters heating. ■ For a setpoint value change greater than -30 K, a adaptation cooling is started and the control parameters cooling are recalculated. ■ The verification of the validation of the used control parameters cooling is active.
1	■ The control parameters cooling are not modified through a heating identification. ■ The control parameters cooling are not modified through a setpoint value change. ■ The verification of the validation of the used control parameters cooling is not active.

Basically the calculation of the control parameters cooling are always started through an Automatic Cooling Identification, when activated through Code Number 111.

See also $\rightarrow$ [P031] IDEN>IDEN - Heating Identification.

9.7 Alarm management

Every zone of the controller is monitored on the following alarm values:

- 2 Temperature limit value alarms
- Current alarm in case of "Heating On", i.e. monitoring of the measured current within a $\rightarrow$ [P006] ATOL/AMPT - Current Tolerance by the $\rightarrow$ [P007] ASOL/AMPN - Current Setpoint Value.
- Current alarm in case of "Heating Off", i.e. control as to whether a heating current is measured in the switched off status of the heating control output.
- Sensor break
- Sensor incorrect polarity
- Sensor short-circuit

The status of the zones can be output as collective alarm on the collective alarm outputs AL1, AL2 and AL3 or, in case of two-point zones, as zone-specific alarm on the cooling output .

[P004] GW -/ALLO - Lower Temperature Limit Value GW-

Data type	Word
Adjustment range interfaces, WKV / multiplier	-30...[5]...1300 Unit of measurement input / 10
Adjustment range BA	-30...[5]...999 Unit of the measurement input

Stipulation of the lower temperature limit value.

Functioning method is stipulated in $\rightarrow$ [P038] AZD1/AZD1 - Alarm Output Definition Byte 1.

[P005] GW +/ALHI - Upper Temperature Limit Value GW+

Data type	Word
Adjustment range interfaces, WKV / multiplier	-30...[5]...1300 Unit of measurement input / 10
Adjustment range BA	-30...[5]...999 Unit of the measurement input

Stipulation of the upper temperature limit value.

Functioning method is stipulated in $\rightarrow$ [P038] AZD1/AZD1 - Alarm Output Definition Byte 1.

[P038] AZD1/AZD1 - Alarm Output Definition Byte 1

Data type	Byte
Adjustment range interfaces, WKV, BA / multiplier	[0]...255 / 1

Stipulates the functioning method of the temperature limit values $\rightarrow$ [P004] GW -/ALLO - Lower Temperature Limit Value GW- and $\rightarrow$ [P005] GW +/ALHI - Upper Temperature Limit Value GW+.



Combinations are possible as a setting value. The setting value results from the sum of the identifications.



With a setting value 72 (corresponds to the sum of the identifications 8 and 64), the zone is checked for absolute $\rightarrow$ [P005] GW +/ALHI - Upper Temperature Limit Value GW+ and sensor short-circuit TCAL. An alarm is output in the case, where the actual value has exceeded the temperature limit value once, when a sensor short-circuit is pending.

Identification	Bit	Functioning method
1	0	Current alarm with "switched off heating" (thyristor alarm)
2	1	Current tolerance alarm. Measured actual current outside of current tolerance band
4	2	Lower temperature limit value
8	3	Upper temperature limit value
16	4	Without function
32	5	Without function
64	6	Sensor short-circuit alarm TCAL

Identification	Bit	Functioning method
128	7	Sensor break/sensor incorrect polarity

[P039] AZD2/AZD2 - Alarm Output Definition Byte 2

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Stipulates the functioning method of the temperature limit values ->[P004] GW -/ALLO - Lower Temperature Limit Value GW- and ->[P005] GW +/ALHI - Upper Temperature Limit Value GW+.



Combinations are possible as a setting value. The setting value results from the sum of the identifications. Bit 0-4 valid for all zones

Identification	Bit	Functioning method
1	0	Error during identification phase (Drift)
2	1	Maximal setpoint / end value of measurement range exceeded
4	2	GW- after setpoint value reached
8	3	Relative limit value band GW+. Alarm, when temperature outside band around setpoint value
16	4	Relative limit value band GW-. Alarm, when temperature outside band around setpoint value
32	5	Collective alarm message for entire control system. Function has higher priority than Collective alarm message by Bit 6
64	6	Collective alarm message for module (zone on basic -, expansion modules)
128	7	Alarm output low active. Alarm output high active, when Bit=0

[SP10] A1D1/A1D1 - Definition Byte 1 - Alarm Output 1

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Together with ->[SP11] A1D2/A1D2 - Definition Byte 2 - Alarm Output 1 and ->[SP12] A1D3/A1D3 - Definition Byte 3 - Alarm Output 1 the functioning method of the alarm output AL1 is defined.



Combinations are possible as a setting value. The setting value results from the sum of the identifications.

Identification	Bit	Alarm cause
1	0	Heating current measured despite switched off heating (thyristor alarm)
2	1	Current tolerance alarm. Measured actual current outside of current tolerance band
4	2	Relative lower temperature limit value GW-
8	3	Relative upper temperature limit value GW+
16	4	Absolute lower temperature limit value GW-
32	5	Absolute upper temperature limit value GW+
64	6	Sensor short-circuit alarm TCAL
128	7	Sensor break/sensor incorrect polarity

[SP11] A1D2/A1D2 - Definition Byte 2 - Alarm Output 1

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Identification	Bit	Alarm cause
1	0	Error during identification phase (Drift)
2	1	Maximal setpoint / end value of measurement range exceeded
4	2	Upper/lower limit value GW-/GW+ after setpoint value reached
8	3	Relative limit value band GW+ (temperature outside band around setpoint value)
16	4	Relative limit value band GW- (temperature outside band around setpoint value)
32	5	Without function
64	6	Alarm status/alarm output storing
128	7	Alarm output low active. Alarm output high active, when Bit=0

->[SP10] A1D1/A1D1 - Definition Byte 1 - Alarm Output 1

[SP12] A1D3/A1D3 - Definition Byte 3 - Alarm Output 1

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Identification	Bit	Alarm cause
1	0	Error CAN
2	1	Error Profibus
4	2	CANopen: Controller in the pre-operational mode
8	3	ERR: System error or channel data error in controller
16	4	Absolute lower temperature limit value (3. setpoint value)
32	5	Absolute upper temperature limit value (4. setpoint value)
64	6	Alarm output resettable
128	7	Calculate alarms also for passivated zones and output

->[SP10] A1D1/A1D1 - Definition Byte 1 - Alarm Output 1

[SP13] A2D1/A2D1 - Definition Byte 1 - Alarm Output 2

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Stipulates the functioning method of the alarm output 2.

->[SP10] A1D1/A1D1 - Definition Byte 1 - Alarm Output 1

[SP14] A2D2/A2D2 - Definition Byte 2 - Alarm Output 2

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Stipulates the functioning method of the alarm output 2.

->[SP11] A1D2/A1D2 - Definition Byte 2 - Alarm Output 1

[SP15] A2D3/A2D3 - Definition Byte 3 - Alarm Output 2

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Stipulates the functioning method of the alarm output 2.

->[SP12] A1D3/A1D3 - Definition Byte 3 - Alarm Output 1

[SP16] A3D1/A3D1 - Definition Byte 1 - Alarm Output 3

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Stipulates the functioning method of the alarm output 3.

->[SP10] A1D1/A1D1 - Definition Byte 1 - Alarm Output 1

[SP17] A3D2/A3D2 - Definition Byte 2 - Alarm Output 3

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Stipulates the functioning method of the alarm output 3.

->[SP11] A1D2/A1D2 - Definition Byte 2 - Alarm Output 1

[SP18] A3D3/A3D3 - Definition Byte 3 - Alarm Output 3

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Stipulates the functioning method of the alarm output 3.

->[SP12] A1D3/A1D3 - Definition Byte 3 - Alarm Output 1

9.8 Heating Current Monitoring

A monitoring of the heating current enables the secure and early identification of the following faults:

- Insulation damage and/or partial failures of heaters
- Total loss of a heater of a group connected in parallel e.g. at the hot-channel distribution column or at the extrusion tool.
- Failures of individual control zones,
- For example, through defective heater, triggered protection interrupt or defective power circuit-breaker.
- Shorts on the power circuit-breakers (solid-state relay, TRIAC's, relay, contactor)

The measurement of the heating currents is implemented in a fixed time raster. The error messages are calculated after every measurement. For the avoidance of nuisance alarms through faulty measurements, the appropriate measurement is repeated with identification of a fault immediately and repeatedly before an alarm signal of the controller is output.

In this case the two following error types are distinguished between:

(a) *Tolerance alarm (SAE-Alarm)*

An alarm is output only if the measured current is located outside of the defined tolerance. This alarm is usually only evaluated as a prior warning.

(b) *Current alarm with "switched off heating" (SAA-Alarm, thyristor alarm)*

Short-circuits, "sticking" contactors and/or "alloyed" sound-state relays are causes for this alarm. Since, in this case, the heaters heat with full power, this alarm must be considered as a "critical alarm" which e.g. has as consequence a machine stop.

[P006] ATOL/AMPT - Current Tolerance

Data type

Word

Adjustment range interfaces, WKV, BA / multiplier 0.0...[20.0]...99.9 % / 10

Stipulates a tolerance band around the ->[P007] ASOL/AMPN - Current Setpoint Value. A current alarm in case of "heating on", i.e. is a current tolerance alarm is output when a heating current is measured outside of the tolerance range

Current actual value < x ASOL/AMPT (1 - (ATOL/100)) and

Current actual value > x ASOL/AMPT (1 + (ATOL/100)).

is measured



In case of a current setpoint value of ASOL/AMPN of 10 A and a current tolerance ATOL/AMPT = 20, a current alarm in case of "heating on"/current tolerance alarm is output with the following current values:

- Current actual value < 10 A x (1 - (20/100)) = 8 A
- Current actual value > 10 A x (1 + (20/100)) = 12 A

[P007] ASOL/AMPN - Current Setpoint Value

Data type

Integer

Adjustment range interfaces, WKV, BA / multiplier [0.0]...200.0 A / 10

Comparative value for the heating current of the zone to be measured. The current setpoint value can be stipulated

- manually or

- be measured automatically by means of the current transfer function .

werden.

[Zone 041] AEND/AMPE - Current Range End Value

Data type Word
Adjustment range interfaces, WKV, BA / multiplier 0...[120]...999 A / 10

Adaptation of the indicated current value to the measurement signal of the current transformer.
 PSG standard current transformers provide a heating current proportional voltage of 42mVeff/A. This value meets the current range end value of 120A. In case of current transformers with other measured voltage, the indicated current value can be adapted.



Current transformer supplies 21 mVeff/A.
 For adaptation of the display AEND/AMPE must be set to 240A.

For ->[SP26] ADEF/AMPD - Heating Current Measurement Method individual current measurement, the current range end value can be set individually for each zone.

For ->[SP26] ADEF/AMPD - Heating Current Measurement Method summation current measurement, the current range end value must be equal for all zones assigned to one and the same current transformer.

[P056] SUMW/NoTR - Allocation of Current Transformer

[P050] SUMW/NoTR - Allocation of Current Transformer (For controller with firmware: 86, 88)

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...32 / 1

With summation current measurement, the setting value stipulates the current measurement input to which the current transformer(s) for the corresponding zone is (are) connected. The setting value 0 means that no current transformer is planned for the zone.

[SP26] ADEF/AMPD - Heating Current Measurement Method

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Stipulates the measurement method of the heating current measurement.

0	Deactivated current monitoring
1	Without function.
2	Without Function.
3	Without Function.
4	Summation current measurement. Display: currently measured current ■ Degree of operation <= 0%: Display of the last measured current value in case of switched-off heating ■ Degree of operation <= 0% display of the last measured current value in case of switched-off heating
5	Summation current measurement. Display: last measured current value differing from 0A
6	Summation current measurement. Display: current value in case of measured "switched-off heater"
7	Summation current measurement. Display: currently measured current value
8	Summation current measurement. Display: currently measured current value (also at degree of operation 0) ■ Degree of operation <= 0%: Display of the last measured current value in case of switched-off heating ■ Degree of operation <= 0% display of the last measured current value in case of switched-off heating. Measurement also at degree of operation = 0%.
9	Summation current measurement. Display: last measured current value differing from 0A (also at degree of operation 0)

10	Summation current measurement. Display: current value in case of switched-off heater (also at degree of operation 0)
11	Summation current measurement. Display: currently measured current value (also at degree of operation 0)
12	Summation current measurement. Display: currently measured current value (also at relay output Heating) ■ Degree of operation > 0%: Display of the last measured current value in case of switched-off heating ■ Degree of operation <= 0% display of the last measured current value in case of switched-off heating. In case of adjustment RELH = on.
13	Summation current measurement. Display: last measured current value differing from 0A (also at relay output Heating)
14	Summation current measurement. Display: current value in case of switched-off heater (also at relay output Heating)
15	Summation current measurement. Display: currently measured current value (also at relay output Heating)
16	Without function.
17	Without function.
18	Without function.

[SP37] MSAA/AMPM - Maximum Current Value with Measurement Heater Off

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier 0.1...[0.5]...2.0 A / 1

Stipulates the limit value, above which with a current measurement a current alarm is output in case of "Heating Off". The measurement is implemented with measurement of the heating currents.

[SP38] SUW /VOLT - Allocation of Voltage Module

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

With the SUW module (is measured accompanying the measurement of the heating currents the mains voltage). With this value the heating currents are adapted to a standardized voltage of 400 V independently of line voltage fluctuations.

Stipulates the current measurement input to which the SUW module is connected.

9.9 Group functions

Every zone can be assigned to a group. For this, 24 groups are available. With the assistance of the groups, for example, event-controlled functional chains can be formed.

The group functions have controller-overall effect, if the controllers are connected with each other over CAN-Bus.



The group function is storing.

- It is carried out after reset of the control system
- after deactivation of the Digital Input 2 if the system parameter $\rightarrow$ [SP25] INPD/INPD - Function of Digital Inputs= 0 or 1 is set adjusted.

durchgeführt.

[P058] GPNr/GPNo - Group Number

[P052] GPNr/GPNo - Group Number
(For controller with firmware: 86, 88)

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...24 / 1

Assigns the control zone to a group with the group number.

Setting value = 0 means that the zone is not assigned to any group.

[P059] GPF /GPF - Group Release

[P053] GPF/GPF - Group Release
(For controller with firmware: 86, 88)

Data type Byte/1
Adjustment range interfaces, WKV, BA / multiplier [0]...24 / 1

Stipulates the group from which a release is given.

Setting value = 0 means that the zone does not require any release from another group, i.e. the zone starts immediately.

[P060] GPM /GPM - Group Mode

[P054] GPM/GPM - Group Mode
(For controller with firmware: 86, 88)

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...255 / 1

Stipulates the condition whereby the release group issues a release or defines the function that is implemented for all zones of a group.

0	Release, when releasing group [actual value > (setpoint value - lower temperature limit value GW-)]
1	Release, when releasing group [actual value > FGW1/LVA1]
2	Release, when releasing group [actual value > FGW2/LVA2]
3	Release, when releasing group [actual value > FGW3/LVA3]
4	Release, when releasing group [actual value > FGW4/LVA4]
5	Send the setpoint value received over CAN bus interface is sent to all other zones of the group.
10	As 0. After zone reset zone is heated up from the sloping setpoint value assuming.
11	As 1. After controller reset, zone is heated up starting from the sloping setpoint value.
12	As 2. After controller reset, zone is heated up starting from the sloping setpoint value.
13	As 3. After controller reset, zone is heated up starting from the sloping setpoint value.
14	As 4. After controller reset, zone is heated up starting from the sloping setpoint value.

[SP42] FGW1/LVA1 - Release Limit Value 1 (Group Mode)

Data type	Integer
Adjustment range interfaces, WKV / multiplier	[0]...1300 Unit of the measurement input / 1
Adjustment range BA	[0]...999 Unit of the measurement input

Release limit value for the release group.

[SP43] FGW2/LVA2 - Release Limit Value 2 (Group Mode)

Data type	Integer
Adjustment range interfaces, WKV / multiplier	[0]...1300 Unit of the measurement input / 1
Adjustment range BA	[0]...999 Unit of the measurement input

Release limit value for the release group.

[SP44] FGW3/LVA3 - Release Limit Value 3 (Group Mode)

Data type	Integer
Adjustment range interfaces, WKV / multiplier	[0]...1300 Unit of the measurement input / 1
Adjustment range BA	[0]...999 Unit of the measurement input

Release limit value for the release group.

[SP45] FGW4/LVA4 - Release Limit Value 4 (Group Mode)

Data type	Integer
Adjustment range interfaces, WKV / multiplier	[0]...1300 Unit of the measurement input / 1
Adjustment range BA	[0]...999 Unit of the measurement input

Release limit value for the release group.

9.10 Serial data interface

The description of the communication protocols, as well as the stipulation of the configuration parameters, are to be taken from the protocol descriptions and the parameter/object lists.

[SP01] PROT/PROT - Protocol

Data type	Char
Adjustment range interfaces	[0]...2 / 1
Adjustment range WKV	0-[PSG-2], 1-rtu, 2-HRS
Adjustment range BA	[PSG], rtU, HrS

Protocol for communication over serial data interface.

0	PSG II
1	MODBUS RTU
2	HRS: as PSG II. For operation in PSG control cabinets with PC operator interface.

[SP02] BAUD/BAUD - Baud Rate

Data type	Char
Adjustment range interfaces	0...[4] / 1
Adjustment range WKV	0-1200, 1-2400, 2-4800, 3-9600, 4-[19200]
Adjustment range BA	12, 24, 48, 96, [192]

[SP03] STOP/STOP - Number of Stop Bits

Data type Char
Adjustment range interfaces, WKV, BA / multiplier 0...[1]...2 / 1

Number of the stop bits with communication over the serial data interface.

[SP04] PARI/PARI - Parity

Data type Char
Adjustment range interfaces [0]...2 / 1
Adjustment range WKV 0-[no], 1-even, 2-odd
Adjustment range BA [oFF], E, odd

Parity bit for communication over serial data interface.

[SP34] SAD2/SAD2 - Software Address Expansion Unit 1

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...31 / 1

Applies only in case of ->[SP01] PROT/PROT - Protocol = PSG.

The address of the first 8 control zones can be stipulated flexibly over the software address.

- In case of setting value equal to 0, the switch position of the addressing DIP switches is employed for the addressing.
- In case of setting value greater than 0, the software address is employed for the addressing and the addressing DIP switches are without function. The software address defines the address of the first 8 control zones of the controller. The addresses of the further 8-zone blocks are sequential.

[SP35] SAD3/SAD3 - Software Address Expansion Unit 2

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...31 / 1

->[SP34] SAD2/SAD2 - Software Address Expansion Unit 1

[SP36] SAD4/SAD4 - Software Address Expansion Unit 3

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...31 / 1

->[SP34] SAD2/SAD2 - Software Address Expansion Unit 1

[SP40] MADR/MADR - Modbus Base Address

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier 0...[32]...255 / 1

Valid only in case of ->[SP01] PROT/PROT - Protocol = rtu.

Determines the address. Stipulates the Modbus address of the first zone of the controller. The MODBUS addresses of the following controller zones are sequential.

->Addressing and Further Functions by DIP Switch

9.11 CANBUS



The description of the communication protocol, as well as the stipulation of the configuration parameters, are to be taken from the protocol description and the parameter/object list.

[SP05] CANB/CANB - CAN Baud Rate

Data type	Char
Adjustment range interfaces	[0]...4 / 1
Adjustment range WKV	0-[100K], 1-125K, 2-250K, 3-500K, 4-1M
Adjustment range BA	[100], 125, 250 500, 999

Setting of data transfer rate of CAN bus interface.

The setting of the CAN baud rate for firmware version S is done by DIP switch 5 & 6 (->Baud rate CAN (only for firmware version S)), the system parameter CANB is therefore without function.

->Addressing and Further Functions by DIP Switch

[SP06] CADR/CADR - CANopen Base Address

Data type	Char
Adjustment range interfaces, WKV, BA / multiplier	0...[32]...127 / 1

CAN-Bus address of the controller

->Addressing and Further Functions by DIP Switch

[SP07] A-OP/A-OP - Auto-Operational Mode CANopen

Data type	Bit
Adjustment range interfaces	0, [1]
Adjustment range WKV	Off, On
Adjustment range BA	oFF, [on]

0	The components on the CAN-Bus are provided with the "Auto-operational" command from a CANopen Master.
[1]	The controller, as well as that relevant CAN peripheral components, are functional in CAN-open operation, also without CAN-open masters. For this, the controller sends the "Auto-operational Mode On" command.

[SP08] OPEN/OPEN - CANopen Protocol

Data type	Bit
Adjustment range interfaces	0, [1]
Adjustment range WKV	Off, On
Adjustment range BA	oFF, [on]

0	The components on the CAN-Bus are provided with the "Auto-operational" command from a CANopen Master.
[1]	The controller, as well as that relevant CAN peripheral components, are functional in CAN-open operation, also without CAN-open masters. For this, the controller sends the "Auto-operational Mode On" command.

Parameter without function, because protocol format of CAN bus is exclusively CANopen.

9.12 Profibus DP



The description of the communication protocols, as well as the stipulation of the configuration parameters, are to be taken from the protocol descriptions and the parameter/object lists.

[SP09] DPAD/DPAD - Profibus DP Slave Address

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier 0...[30]...255 / 1

< 128	The Profibus DP address of the controller results of the addition of the Profibus DP slave address DPAD, as well as the device ID (by DIP switch setting of DIPs 1...4).
>= 128	The Profibus DP address is independent of the device ID and results of the subtraction of the setting for DPAD and 128.
	DPAD = 134, i.e. Profibus DP address of controller = setting of DPAD - 128 = 6

Profibus address of controller
->Addressing and Further Functions by DIP Switch

- [SP46] DP-T/DP-T - Timeout DP (Zone OFF)
(For controller with firmware version: 34, 35, 36, 37, 46, 47, 48, 49, 66, 67, 68, 69)
[SP47] DP-T/DP-T - Timeout DP (Zone OFF)
(For controller with firmware version: 30, 31, 32, 33)
[SP53] DP-T/DP-T - Timeout DP (Zone OFF)
(For controller with firmware version: 22, 23, 26, 27)

Data type Byte
Adjustment range interfaces, WKV, BA / multiplier [0]...120 seconds / 1

Stipulates the time within which communication over the CAN Bus must occur. If no communication is determined, no actuating signal is output to the control outputs.
Setting value = 0 deactivates the function.

9.13 Representation of operating/visual display units BA

[SP19] DISP/DISP - Display in Case of Passivated Zone (BA)

Data type	Bit
Adjustment range interfaces	[0], 1
Adjustment range WKV	[oFF], on
Adjustment range BA	[oFF], on

[0]	The zone displays of passivated zones are faded out.
1	The zone displays are represented also in case of passivated zones.

[SP29] ASTB/DIS% - Display in Manual Mode (BA)

Data type	Bit
Adjustment range interfaces	[0], 1
Adjustment range WKV	[Actual value], Degree of operation
Adjustment range BA	[lSt], StL

If manual mode activates...

[0]	Display of the actual values in the zone displays.
1	Display of the setting levels in the zone displays.

[SP39] SPRA/LANG - Language (BA)

Data type	Byte
Adjustment range interfaces	[0], 1 / 1
Adjustment range WKV	0-[German], 1-English
Adjustment range BA	[000], 001

Display of the short codes in the information display, as well as that status/error report in the zone displays in language adjusted.

[0]	German
1	English

9.14 Other parameters

[P032] APPL/APPL - Application

Data type	Byte
Adjustment range interfaces, WKV, BA / multiplier	[0]...255 / 1

By means of the applications parameter, extended customer-specific functions or adaptations to pre-determined applications can be connected to the standard functions.

0	Standard controlled systems
1	Medium fast controlled system (maximal delay time 4 minutes)
2	Fast controlled system (maximal delay time 30 minutes)
3	Customer-specific application
4	Hot air application
5	Hot Runner Control Cabinet
6	Without function
7	Customer-specific application

8	Without function
9	Customer-specific application
10	Customer-specific application (with special firmware)
11	Customer-specific application
12	Customer-specific application
13	Without function
...	
14	
15	Customer-specific application (with special firmware)
16	Customer-specific application
17	Without function
...	
19	
20	Customer-specific application
21	Without function
...	
30	
31	Customer-specific application
32	Without function
...	
62	
63	Customer-specific application

By the Bit 7 of parameter APPL/APPL the scaling of the actual values (standard signal input U/I direct on controller, and/or external by CAN) is managed (->[P042] ANZ-/RG L - Lower Temperature Level at Standard Signal Inputs, ->[P043] ANZ+/RG - Upper Temperature Level with Standard Signal Inputs).

[P051] STÖR/EXPS - Expert System

Data type	Bit
Adjustment range interfaces	[0], 1
Adjustment range WKV	[oFF], on
Adjustment range BA	[oFF], on

Without function.

[P046] K-XP/K-XP - Correction Factor for XP-H

Data type	Byte
Adjustment range interfaces, WKV, BA / multiplier	0.1...[1.0]...9.9 / 10

= 1	Control without correction
> 1	The control is "sharper"; in case of a control deviation the reaction in the degree of operation is intensified.
< 1	The control is "damped"; in case of a control deviation the reaction in the degree of operation is weakened.

Correction factor for ->[P011] XP-H /XP-H - Heating Proportional Band, without direct access into control parameters and/or the model.

Corrected XP-H/X-PH = XP-H/XP-H x 1/(K-XP/K-XP)

[P047] K-TV/K-TV - Correction Factor for TV-N

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier 0.1...[1.0]...9.9 / 10

= 1	Control without correction
> 1	The control is "quicker"; in case of a control deviation the change in the degree of operation is accelerated.
< 1	The control is "slower"; in case of a control deviation the change in the degree of operation is decelerated.

Correction factor for ->[P012] TD-H /TD-H - Heating Derivative Time, ->[P013] TI-H /TI-H - Heating Integral Time, without direct access into control parameters and/or the model.

[P052] KXPH/KXPH - Correction Factor XP-H for Disturbance Reaction

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0.0]...1.0 / 10

Without function.

[P053] KXPK/KXPK - Correction Factor XP-K for Disturbance Reaction

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0.0]...1.0 / 10

Without function.

[P054] KTIH/KTIH - Correction Factor TI-H for Disturbance Reaction

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0.0]...1.0 / 10

Without function.

[P055] KTIK/KTIK - Correction Factor TI-K for Disturbance Reaction

Data type

Byte

Adjustment range interfaces, WKV, BA / multiplier [0.0]...1.0 / 10

Without function.

[SP27] OUT /OUT - Actuator Type Basic Unit

Data type

Byte

Adjustment range interfaces

[0], 1

Adjustment range WKV

[---], CANOUT

Adjustment range BA

[---], CAn

[0]	Without function.
1	Without function.

[P049] PTOL/PTOL - Process Tolerance

(For controller with firmware 86, 88)

Data type

Word

Adjustment range interfaces, WKV, BA / multiplier [0]...100 % / 1

[0]	Without function
>0	Admissible tolerance of the process before an alarm is output.

[P046] VZHK/VZHK - Delay Heating Cooling

(For controller with firmware version: 30, 31, 32, 33)

[P047] VZHK/VZHK - Delay Heating Cooling

(For controller with firmware version: 34, 35, 36, 37)

Data type Byte

Adjustment range interfaces, WKV, BA / multiplier [0]...120 seconds / 1

The change from Heating to Cooling and vice versa is executed after the adjusted time here.

10 Functions

10.1 Code numbers

Behind code numbers are complex system-specific or process-specific functions, which simplify the handling of certain functions with the controller or which repair exception states in which the controller finds itself e.g. after faults or alarms.

Code numbers can be activated over all interfaces (see corresponding protocol descriptions) and the operating and visual display units.



The normal control mode is exited, when using code numbers.

DEC	HEX	Function	Information on the function
10	0A	Load setpoint value set 1 from EEPROM	
11	0B	Load setpoint value set 2 from EEPROM	
12	0C	Load setpoint value set 3 from EEPROM	
13	0D	Load setpoint value set 4 from EEPROM	
20	14	Write setpoint value set 1 to EEPROM	
21	15	Write setpoint value set 2 to EEPROM	
22	16	Write setpoint value set 3 to EEPROM	
23	17	Write setpoint value set 4 to EEPROM	
30	1E	Switch on °C	
31	1F	Switch on °F	
34	22	CANopen-Default-Init	
40	28	Resetting the temperature ramp	
41	29	Manual activation of a current measurement	->Manual Activation of a Current Measurement (Code Number 41)
50	32	Connect heating outputs HRS-PC	
111	6F	Start automatic cooling adaptation	
177	B1	Start current transfer all zones	
200	C8	Switch on keylock	Operating and display unit function
201	C9	Switch off keylock	Operating and display unit function
202	CA	Default values of CAN-Bus	
300	12C	Pressure measurement offset matching	(only ETR112MD)
305	131	Start degree of operation monitoring	(only ETR132II, ETS132II)
400	190	Take over of switch-on configuration	
440	1B8	Reset-acknowledge all alarms	
441	1B9	Reset-acknowledge Alarm Output 1	
442	1BA	Reset-acknowledge Alarm Output 2	
443	1BB	Reset-acknowledge Alarm Output 3	
444	1BC	Reset-acknowledge pressure alarms	(only ETR112MD)
445	1BD	Cancel identification	
501	1F5	Reset-acknowledge software reduction	
502	1F6	Block group release	
600	258	Start diagnostic function for sensor allocation	->

DEC	HEX	Function	Information on the function
601	259	Start heating current diagnostics function	->Diagnostic function (Code Number 601) - Start Current Measurement
602	25A	End diagnostic function and delete alarms	
702	2BE	Standard calibration thermocouple Fe-L	
705	2C1	Reset alarms and controller reset	
706	2C2	New entry of EEPROM check sum	
722	2D2	Standard calibration thermocouple Fe-L	
742	2E6	Standard calibration thermocouple Fe-L	
759	2F7	Establish ex-works state and controller reset	
769	301	Load stored customer configuration	
770	302	Store customer configuration	
800	320	Set all trim values to 0	
801	321	Set all trim values according to zone 1	
802	322	Set all trim values according to zone 1/100°C	
921	399	Read Profibus DP list	
922	39A	Write Profibus DP list	
985	3D9	Standard CPU matching	(only ETR 112)
999	3E7	Reset control system	
	Code numbers marked like this do not appear in the online list of value.		

10.2 Diagnostic function (code number 600) - Allocation of Sensor and Heating

The controller has a complex automated function to check the allocation of sensors and Heating. The function checks, whether sensors and Heating are allocated and wired correctly.

The function uses the configuration parameter $\rightarrow$ [P028] AFZ4/STT4 - Start-up Time of 4. Set Point/4. Lowering Value. By this, a zone specific testing period is specified. The testing period defines the time, the zone should react on a trigger by the degree of operation.



For an optimal diagnostic process, the diagnostic function should be executed, when the control zones are in cold condition.

- Specify a setpoint value for the zone that is smaller than the actual value
- Check the configuration parameter $\rightarrow$ [P028] AFZ4/STT4 - Start-up Time of 4. Set Point/4. Lowering Value
- Passive zones are not included in the diagnostics

The diagnostic function is basically executed until the end, even when errors are recognized. It is only interrupted, when a temperature rise for a degree of operation = 0% is detected, i.e. the actuator is defective, what can lead to an overheating of the control zone.

The check routine is started by entry of code number 600 and runs in two phases.

Phase 1: Complete Check of all Zones together

In phase 1 the degree of operation

- of all active zones,
- whose setpoint value is greater than 0°C

is set to 0% and all actual value are monitored. Using the operating and display unit BA, in the zone display of the zones, relevant for diagnostic process, the message **dIA** is output. The zone display for the other zones is dimmed. The corresponding information can be requested by message flag ZoneFMode by interface.

Rises the actual value of any zone at least 5°C in between the testing period, in the zone display for this zone **dE** and **888** is displayed alternately and the check routine is completely stopped. The stopped check routine must be acknowledged by code number 602.

Phase 2: Single Check

After termination of phase 1 (takes as long, as the maximal specified value for $\rightarrow$ [P028] AFZ4/STT4 - Start-up Time of 4. Set Point/4. Lowering Value)

a single check of each zone, consecutive for each zone, is started.

For this, the degree of operation of one zone is set to 100% and monitored, whether a temperature rise of 5°C in between the specified testing period $\rightarrow$ [P028] AFZ4/STT4 - Start-up Time of 4. Set Point/4. Lowering Value is detected. Using the operating and display unit BA, in the zone display the message **dIA** is output.

After termination of the single check for all zones, the diagnostic result is immediately displayed in the zone display for the relevant zones. Alternately **dE** (DiagnosticResult) and a number are displayed, where the diagnostic result could easily be deduced.

Message BA at Diagnostic End		Meaning
dE	0	Zone OK
dE	1_32	The sensor to this zone is wrongly connected to channel x
dE	- 1_-32	The sensor to this zone is wrongly connected to channel x and with reversed polarity
dE	999	Sensor break
dE	888	Temperature rise in spite of degree of operation 0%
dE	≡ 777	No temperature rise during diagnostic period detected

The status of diagnostics of the zone can be requested by message flag ZoneFMode (for PSGII protocol offset 0x60).

Value of message flag ZoneFMode [1...5]	active = 25(dec)
Value of message flag ZoneFMode [1...5]	Diagnostics ended = 24 (dec)

(->Information 'zone text')

When the diagnostics is terminated, the diagnostic result could additionally be requested by offset 0x6B (PSGII protocol), which has the same value like the message in the zone display of the operating an display unit BA.

After termination of the diagnostics the check routine must be acknowledged by code number 602. With the same code number the check routine can be stopped.

10.3 Diagnostic function (Code Number 601) - Start Current Measurement

After entry of the code number 601, a complex routine for an automated check of the allocation of "Heating/Current transformer" is started. The routine checks whether the feed lines for the Heating is led through the corresponding current transformer.

After start of the function, **dIA** is displayed in the zone displays, when the operating and display unit BA is used. The corresponding information can be requested by message flag ZoneFMode by interface.

The following messages could result out of the diagnostic function.

Message	Meaning
dF1	No current was detected
dF2	A current was detected on another zone
dF3	A current was detected on the right and on another zone
dF4	A current was measured, although no current should be detected
dE	Zone OK

10.4 Manual Activation of a Current Measurement (Code Number 41)

After entry of code number 41 in the process of cyclic current measurement (->[SP26] ADEF/AMPD - Heating Current Measurement Method <> 0) a current measurement is once triggered.

a current measurement is once triggered.

The current measurement is initiated by sending the code number 41. The code number is transferred (ca. 1 second).



Only for protocol Profibus DPEA the code number 0 must be send afterwards [Reset of data exchange buffer].

Wait for the end of the current measurement (at least 8 seconds), the alarm analysis follows. The cyclic current measurement runs afterwards normal.

10.5 Auto Tuning (Identification)

The controller offers methods, with which

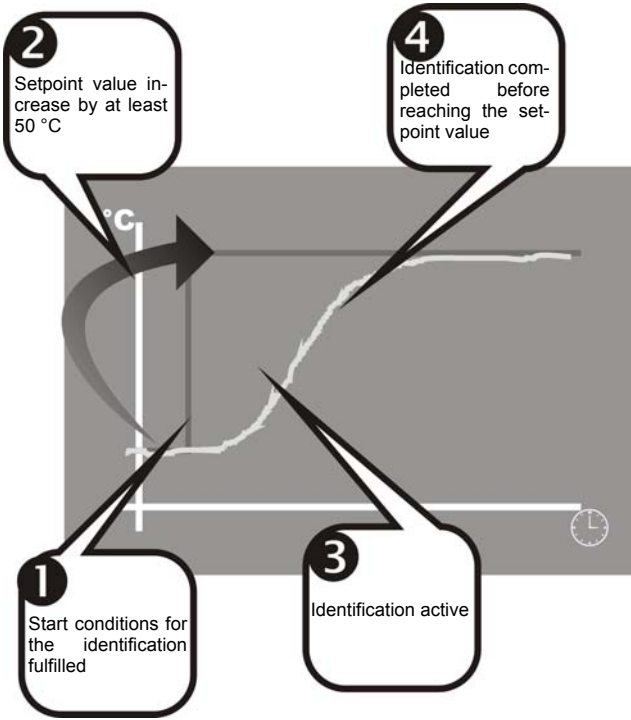
the Heating control parameters (->[P031] IDEN>IDEN - Heating Identification = on) after the first setpoint value jump of > +50 K

- After reset of controller (i.e. supply voltage off/on or by code number)
- after zone reset (i.e. setpoint value 0°C/32K or zone passivation)
- after sensor break

the Cooling control parameters dependant on regulation procedure after each setpoint value jump > -30 K

- ->[P031] IDEN>IDEN - Heating Identification = on
- ->[P034] KHLG/COOL - 3-Point Operation = on
- ->[P040] PAKF/CFIX - Cooling Parameter Fixed (Heating Identification) = off

can be automatically calculated and the controller is adapted to the factors of the connected control system. Both methods are named Heating identification and Cooling identification. Heating identification and Cooling identification can be activated independent of each other. The control parameters are power failure safe stored in the EEPROM.



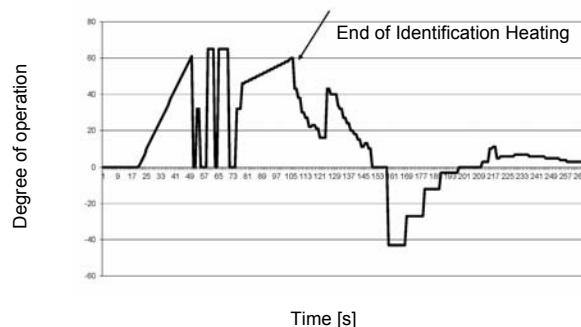
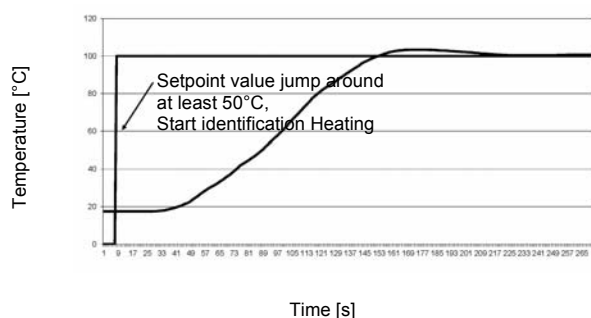


The identification function should be deactivated after executing it once if using the temperature controller on constant zones.

This ensures that the zone always has a fixed model and the same control parameters is controlled with optimum quality and there may be no mismatches.

Setting	
Specify Heating identification	->[P031] IDEN>IDEN - Heating Identification
Specifies whether the Cooling control parameters are derived from the Heating control parameters after Heating identification.	->[P040] PAKF/CFIX - Cooling Parameter Fixed (Heating Identification)

Identification Heating



10.5.1 Monitoring function of auto tuning

10.5.1.1 Drift control

Before start of identification an automatic drift control is executed, which checks the current rate of rise of temperature. This check ensures that there are no erroneous models determined due to lack of start-up conditions.

An identification is only started, when the rate of rise of the connected zone is less than 0.6 K/minute.

Is a larger rate of rise determined,

- at 2-point zones a degree of operation of 0% is output
- at 3-point zones a degree of operation of -5% is output

it is waited, until the rate of rise is below 0.6 K/minute.

Using the operating and display unit for the controllers, in the zone display the message **drl** is output alternately with the actual values of the zones.

10.5.1.2 Actuator monitoring

This works only for controllers, equipped with heating current monitoring. Detects the identification phase, that the actuator is switched off (detection by current actual value), the identification is aborted and for the degree of operation is output 0%. The already detected information by the started identification are discarded.

Using the operating and display unit for the controllers, in the zone display the message **IF** (error message "No heating current measured") is output alternately with the actual values of the zones.

Furthermore, the controller checks cyclically whether the actuators are reconnected. Is detected, that the actuator is switched on again, the identification is automatically restarted. In the zone displays **Id** appears alternately with the actual values of the zones.



For temperature controller without heating current monitoring

During the identification phase it must be ensured at any time, that the actuators are not deactivated.

Are the actuators deactivated anyway, the identification offers erroneous results for the model and a mismatch of the control parameters, that causes poor results for the control.

10.5.2 Online-Control

The Online-Control can be activated/deactivated by the parameter $\rightarrow [P030]$ **ONLK/ONLC** - Online Control. It is used to monitor the model, determined during identification phase, and the targeted adjustment of the Heating control parameters after changes in the behavior of the zone.

Since the changes near the setpoint value are too small to establish meaningful model and thus control parameter changes, the Online-Control acts only outside a band of 3 °C around the setpoint.

10.5.2.1 Actuator monitoring

This works only for controllers, equipped with heating current monitoring. Is detected, that the actuator is switched off, the control is automatically stopped and the status of the zone is "frozen".

Furthermore, it is cyclically checked whether the actuators are reconnected. If this is detected, the calculation of the degree of operation is automatically continued and the Online-Control is reactivated. In the zone displays only the actual values of the zones appear.



Online-Control for temperature controller without heating current monitoring

If the Online-Control is activated it must be ensured at any time, that the actuators are not deactivated.

Are the actuators deactivated anyway, an erroneous correction of the control parameters is executed, that causes poor results for the control.

10.5.3 Cooling adaptation

The operator can choose whether the Cooling control parameters are derived from the Heating control parameters after Heating identification. The calculation procedure is based on the assumption that an appropriate sizing ratio of Heating to Cooling is available. For most of the applications, this assumption is valid.

The parameter $\rightarrow$ [P040] PAKF/CFIX - Cooling Parameter Fixed (Heating Identification) (= off) has to be deactivated. In this case the Cooling control parameters are derived from the Heating parameters directly after end of the identification and power failure safe stored in the EEPROM.

If parameter $\rightarrow$ [P040] PAKF/CFIX - Cooling Parameter Fixed (Heating Identification) (= on) is activated, the Cooling parameters $\rightarrow$ [P015] XP-K /XP-C - Cooling Proportional Band, $\rightarrow$ [P016] TD-K /TD-C - Cooling Derivative Time, $\rightarrow$ [P017] TI-K /TI-C - Cooling Integral Time and $\rightarrow$ [P018] TA-K /CT - Cooling Sampling Time are not changed after an identification. Furthermore no recalculation is done for the Cooling control parameters for a setpoint value reduction from at least 30 K.

Manual cooling adaptation

The exact calculation of the Cooling control parameters is done by a cooling adaptation. This is done for each reduction of the setpoint value from at least 30 K. Prerequisite are

$\rightarrow$ [P031] IDEN/IDEN - Heating Identification = on

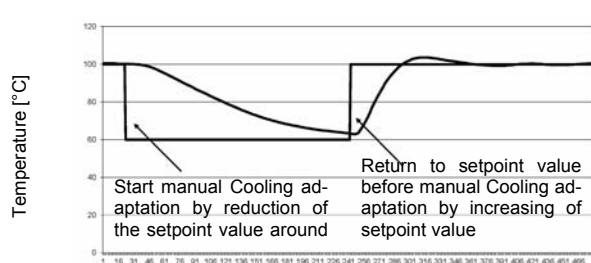
and

$\rightarrow$ [P040] PAKF/CFIX - Cooling Parameter Fixed (Heating Identification) = off.

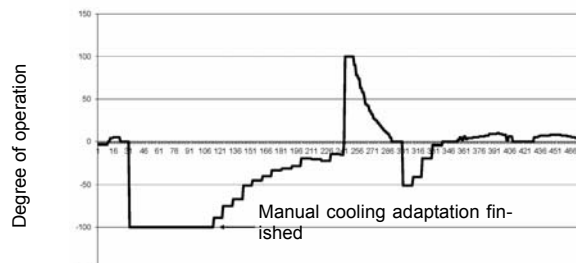
After finishing the Cooling adaptation, the Cooling control parameters $\rightarrow$ [P015] XP-K /XP-C - Cooling Proportional Band, $\rightarrow$ [P016] TD-K /TD-C - Cooling Derivative Time, $\rightarrow$ [P017] TI-K /TI-C - Cooling Integral Time and $\rightarrow$ [P018] TA-K /CT - Cooling Sampling Time are stored power failure save into the EEPROM.

During Cooling adaptation, in the zone display the message **Id** is output alternately with the actual values of the zones on the operating and display unit.

Manual cooling adaptation



Time [s]



Time [s]

10.5.3.1 Automatic cooling adaptation

In addition to the manual Cooling adaptation, the Cooling adaptation can be executed automatically for all Heating/Cooling zones. The automatic Cooling adaptation is triggered by entry of code number 111 (not by entry of lower setpoint value!). The status of the parameters $\rightarrow$ [P031] IDEN/IDEN - Heating Identification and $\rightarrow$ [P040] PAKF/CFIX - Cooling Parameter Fixed (Heating Identification) are irrelevant.

An automatic cooling adaptation

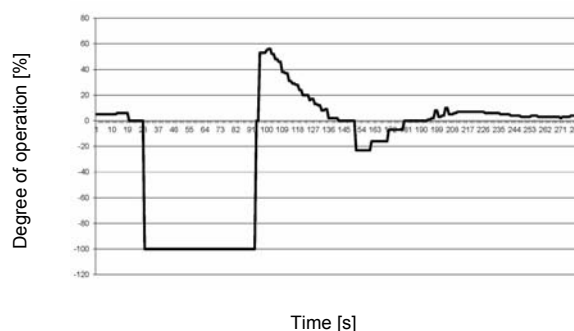
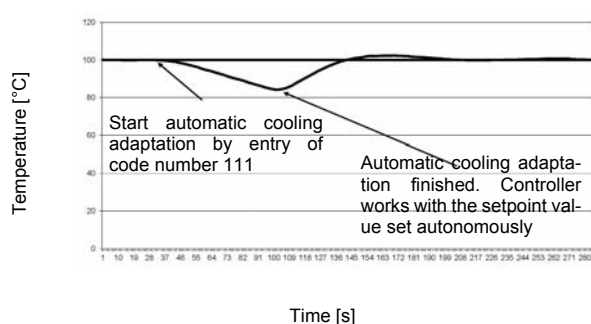
- is started for all 3-point zones simultaneously,
- when its actual values are in between a 3°C band around the setpoint value and
- when the temperature rise does not exceed a certain value

The automatic Cooling adaptation is only executed, when all zones fulfill these start criteria. After finishing the Cooling adaptation and calculation of the Cooling control parameters, the temperature controller works with the specified setpoint value autonomously.



The corresponding zone texts (see chapter ->Overview of zone texts) are displayed.

Automatic cooling adaptation



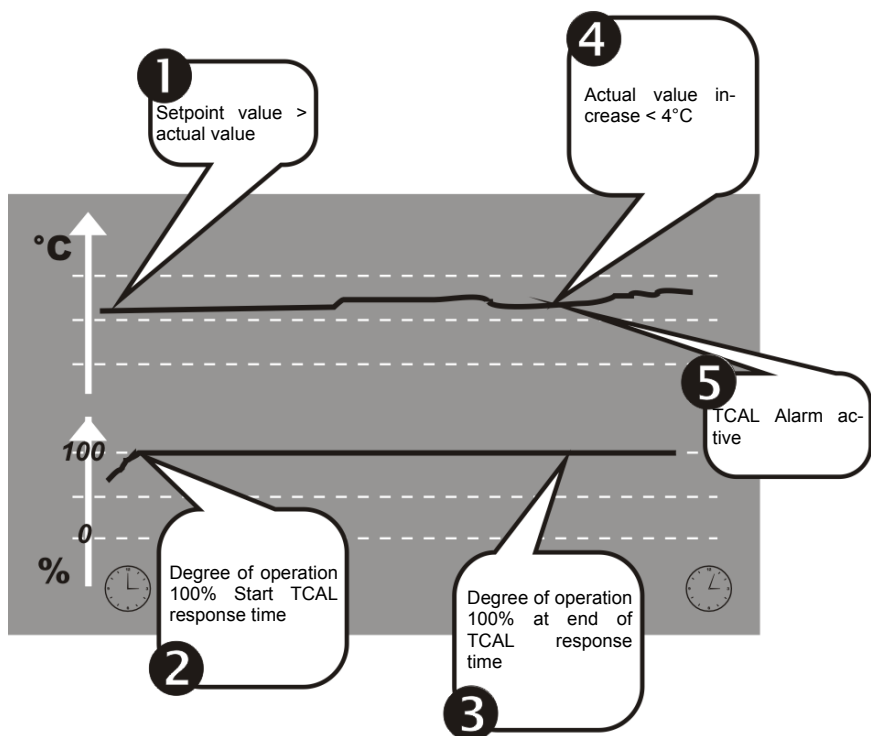
10.6 Monitoring of sensor FAL/TCAL function

Beside sensor break/sensor incorrect polarity, sensor short-circuit is another source of error at measured value recording of thermo couples. A sensor short-circuit can for example be caused by a pinching of the sensor cable. The contact point provides a measurement point not related to the thermal voltage and thus an erroneous reading. Another reason for a TCAL alarm, can be a badly connected sensor in the sensor hole. Although the sensor is not defective, it does not show the actual temperature at the measurement point.

Two causes can result in a TCAL alarm

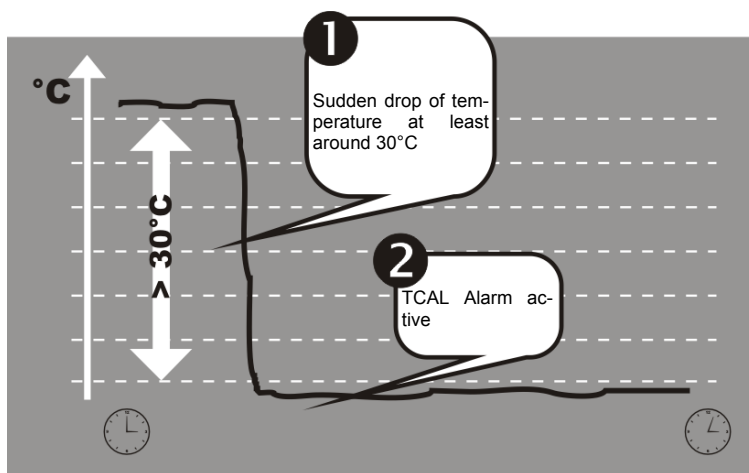
■ static/permanent

A TCAL alarm is generated, when setpoint value > actual value inside TCAL response time at maximal degree of operation (note perhaps limitation of degree of operation) does not result in a temperature increase of 4°C.



■ dynamic

If the difference between current actual value and the last sampled actual value is suddenly greater than 30 K, then a TCAL alarm is immediately triggered after a pre-determined number of control cycles, cause in this case, there must be a defect on the sensor line or on the sensor.



Is one of the two operation status detected, a TCAL status is output and the corresponding zone is passivated. The zone can be activated after acknowledgement of the alarm.

A Sensor Short Circuit Monitoring is not active, when

- a current alarm (Heating ON or OFF) is active
- an identification is active
- a sensor break is detected
- a setpoint value change to a smaller setpoint value is executed

Response time of TCAL

The response time of TCAL prevents unintentional TCAL alarms. The response time is started when all prerequisites for a TCAL alarm are satisfied. Are the prerequisites of the operation status still fulfilled after elapsed response time, an alarm is activated.

No alarm is generated, when the prerequisites for a TCAL are not satisfied during the response time. In this case the response time is restarted at the next opportunity, when the prerequisites are given.

According to the operating point, different TCAL response times are worked with. The response time depends on the dynamic of the connected zone, derived from the sampling time.

- in the setpoint value band: TCAL response time = 30 x heating sampling time
- outside of the setpoint value band: TCAL response time = 20 x heating sampling time

The width of the setpoint value band is depended on $\rightarrow[P011] \text{ } XP-H / XP-H - \text{Heating Proportional Band}$ and is calculated according to

- Setpoint value band = $\rightarrow[P011] \text{ } XP-H / XP-H - \text{Heating Proportional Band} \times 4^{\circ}\text{C}$

	$\rightarrow[P014] \text{ } TA-H / CT-H - \text{Heating Sampling Time} = 10 \text{ seconds (s)},$ $\rightarrow[P011] \text{ } XP-H / XP-H - \text{Heating Proportional Band} = 2.5\%$ Width of the setpoint value band 10°C Response time outside of the setpoint value band: $20 \times 10 \text{ s} = 200 \text{ s}$ Response time inside of the setpoint value band: 300 s
--	---

A TCAL alarm is generated, when the following conditions are fulfilled during the TCAL response time:

- Degree of operation = maximal limitation of output value
- No setpoint value change
- no current alarm (when heating current monitoring active)

Is the TCAL status still not set, after by stop watch defined elapsed time (TCAL - response time), and no actual value increase of at least 4°C has happened, a TCAL alarm is activated.

At $\rightarrow[P032] \text{ } APPL/APPL - \text{Application} = 3$ the TCAL response time after switch on of the controller is basically 20 minutes. At detection of a temperature rise of 4°C , the TCAL response time is set according to the above described (see chapter $\rightarrow \text{Monitoring of sensor FAL/TCAL function}$) operation status. The minimal TCAL response time is limited to 300 seconds ($= 20 \times 15 \text{ s}$, minimal $\rightarrow[P014] \text{ } TA-H / CT-H - \text{Heating Sampling Time} 15 \text{ s}$), to consider the time characteristics of 'extremely slow' zones additionally.

	$\rightarrow[P014] \text{ } TA-H / CT-H - \text{Heating Sampling Time} = 10 \text{ seconds (s)},$ $\rightarrow[P011] \text{ } XP-H / XP-H - \text{Heating Proportional Band} = 2.5\%$ Width of the setpoint value band 10°C Due to $\rightarrow[P014] \text{ } TA-H / CT-H - \text{Heating Sampling Time} < 15 \text{ s}$ the response time is calculated by $\rightarrow[P014] \text{ } TA-H / CT-H - \text{Heating Sampling Time} = 15 \text{ s}.$ Response time outside of the setpoint value band: $20 \times 15 \text{ s} = 300 \text{ s}$ Response time inside of the setpoint value band: 450 s
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10.7 Firmware update

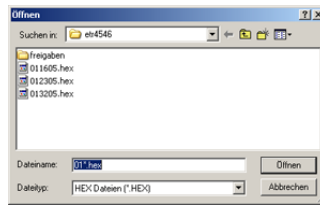
The firmware of the controller is continuously undergoing further development. The controller is update-capable with the aid of the program WinKonVis (Art.No. 039020, executable from Microsoft Windows 98) over the serial interface and CAN and can be maintained at the latest software status after purchase. The controller firmware in the form of a file ("HEX file") is clear of all charges.

WinKonVis is located, exactly as the controller firmware, either on the delivered CD-ROM or you can download it from the home page.

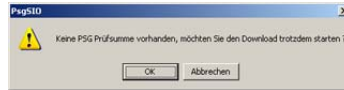
For the implementation of the update over the serial interface, the two interface converters SK232485 (Art. No. 039060, converter RS232-RS485) and SKUSB422 (Art. No. 039065, converter USB-RS485) are available as accessories, for the implementation of the update over CAN of the interface converters the interface converter SKUSBCAN is available (Art. No. 039065, converter USB-CAN).

Preparing update

- WinKonVis must be installed and licensed.
- Optional: Install the driver of the USB-RS485 interface converter or the USB-CAN interface converter from the disk supplied.
- Ensure that the interface connection between PC and controller functions. For this, carry out an interface test under menu item Options/Interface/PSGII Options or Options/Interface/CAN Options or Options/Interface/LAN Options in WnKonVis). In case of interface functioning correctly, a version string is sent from the controller with the interface test, the fault counter is not counted up. In case of erroneous connection, the fault counter is counted up.

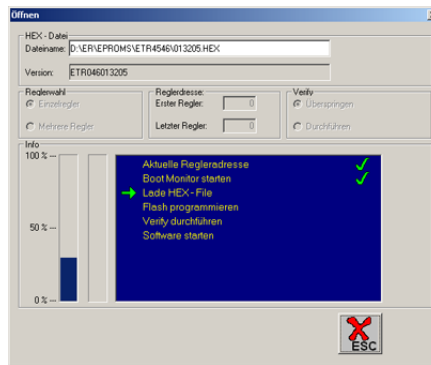


If the HEX file is damaged, then a warning appears. It is absolutely necessary to end the update procedure and provide a non-damaged HEX file.



Start firmware update through clicking on the button "Start".

A progress column displays the current status of the update procedure.



After successful firmware update, the controller is restarted. The dialog box can be closed.

11 Appendix

11.1 FAQ

Here a set of frequently asked questions and the corresponding answers on different topics.

Behavior in case of defective or not connected Pt100 sensors		
	Wire break on connector F+ => Display 1999.9 °C (sensor break active)	
	Wire break on connector F- => Display 1999.9 °C (sensor break active)	
	Wire break on connector 0V => Display -35 °C (TCAL active)	
	Conductor fault on connector F+/0V => Display -30 °C (TCAL active)	
	Conductor fault on connector F+/F- => Display -30 °C (TCAL active)	
	Conductor fault on connector F-/0V => No effect due to 3-wire connection	
	Prerequisite	Sensor type configured as Pt100 ->[P037] FAL /TCAL - Sensor Short-Circuit Monitoring=ON
	*) Negative values can differ.	

11.2 Version history

Version	Date	Changes
1.00.03	7/19/2013	In detail, the following amendments/corrections were made: ■ Setting P041 ■ [P019] specified ■ SIO-LED added ■ RS232 Galvanically not isolated (230 V) ■ ARMP leading zone -> reference zone ■ [P046], [P048] Factor 0.1 ■ Description functions (Auto tuning, ff., monitoring of sensors) added ■ ERR004 added ■ [P033] description adapted ■ Chapter FAQ amended ■ CAN-Bus termination X10 Pin3/4 added ■ Description [P045], [P041] specified
1.00.02	5/12/2010	In detail, the following amendments/corrections were made: ■ Zone parameters [P***], System parameters [SP**] ■ Parameter [Zone 2]STGR/OPWR range MIN from -99 to -100 ■ Other characteristic analog for controllers with other firmware explained ■ CAN-Bus without option for ETR 112 ■ [SP25] INPD/INPD Index 36, 37 for firmware 88, 86 added ■ [P049] PTOL/PTOL value 0 added ■ Diagnostic function by code number 600 and 601 added ■ Code number 41 amended
1.00.01	10/16/2009	In detail, the following amendments/corrections were made: ■ Use of X7/9 for analog output ETR112
1.00.00	2008-12-18	First publication. Valid for WinKonVis software version 1.4.5.6. PSG Plastic Service GmbH Pirnaer Straße 12-16 68309 Mannheim Germany Tel. +49 621 7162 0 Fax +49 621 7162 162 www.psg-online.de info@psg-online.de